NAS 1.9/4: 15/24

JAN 23 1978

VOLUME 15/NUMBER 24
DECEMBER 23, 1977
ACC. NOS. N77-33100 TO N77-34092

STAR

AN ABSTRACT JOURNAL

Scientific and Technical Aerospace Reports

RECEIVED
MIAMI UNIVERSITY
LIBRARIES
JAN 12 1978
DEPOSITORY
DOCUMENTS DEPARTMENT

PRODUCED BY THE
SCIENTIFIC AND TECHNICAL
INFORMATION
OFFICE
NASA

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WHAT YOU CAN DO FOR *STAR*

All users of this abstract service are urged to forward reports to be considered for announcement in *STAR*. This will aid NASA in its efforts to provide the fullest possible coverage of all scientific and technical publications that might support aeronautics and space research and development. If you have prepared relevant reports (other than those that you will transmit to NASA, DoD, or ERDA through the usual contract- or grant-reporting channels), please send them to NASA, Scientific and Technical Information Office/KSI, Washington, D.C. 20546, for consideration.

Reprints of journal articles, book chapters, and conference papers are also welcome. These will be considered for announcement in *STAR's* companion journal, *International Aerospace Abstracts*.

You may specify a particular source to be included in a report announcement if you wish; otherwise the report will be placed on public sale at the National Technical Information Service. Copyrighted publications will be announced but not distributed or sold.

PURCHASE OF *STAR*

The semimonthly issues and the cumulative index issues are available postpaid on subscription and in single copy from the Superintendent of Documents, United States Government Printing Office, Washington, D.C., 20402, United States of America.

Semimonthly issues...

Annual subscription rates: $66.90 domestic; $83.65 foreign. Price per single copy: $2.80 domestic; $3.50 foreign.

Cumulative index issues...

Annual subscription rates: $28.10 domestic; $35.15 foreign. Price per single copy varies according to number of pages.

Domestic subscription rates...

Apply to the United States, Canada, Mexico, and all Central and South American countries, except as noted below.

Foreign subscription rates...

Apply to Argentina, Brazil, French Guiana, Guyana, Surinam, Belize, and all other countries throughout the world.

Payment should be by check, money order, or document coupons, and must accompany order. Remittances from foreign countries should be made by international money order or draft on an American bank, payable to the Superintendent of Documents, or by UNESCO book coupons.

PUBLISHED BY:

UNITED STATES GOVERNMENT
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SCIENTIFIC AND TECHNICAL INFORMATION OFFICE
Scientific and Technical Aerospace Reports, Volume 15, is prepared by the NASA Scientific and Technical Information Facility operated for the National Aeronautics and Space Administration by Informatics Information Systems Company.

The Administrator of the National Aeronautics and Space Administration has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Agency. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through June 30, 1978.

US ISSN 0036-8741

INTRODUCTION

Scientific and Technical Aerospace Reports (STAR) is a major component of a comprehensive National Aeronautics and Space Administration information system covering aeronautics, space, and supporting disciplines. *STAR* is issued on the 8th and 23rd of each month and announces current publications of the following types:

- NASA, NASA contractor, and NASA grantee reports
- Reports issued by other U.S. Government agencies, domestic and foreign institutions, universities, and private firms
- Translations in report form
- NASA-owned patents and patent applications
- Dissertations and theses

Cumulative index volumes are published semiannually and annually.

Journal, book, and conference literature, cover-to-cover journal translations, and certain foreign dissertations are announced in a companion journal, *International Aerospace Abstracts (IAA)*, available on subscription from the American Institute of Aeronautics and Astronautics, Technical Information Service, 750 Third Avenue, New York, N. Y. 10017.

ON-GOING RESEARCH PROJECTS

By arrangement between NASA and the Smithsonian Science Information Exchange (SSIE), a separate section of information on aerospace-related *On-Going Research Projects* is inserted into each issue of *STAR*. The insert presents titles of active NASA grants and university contracts, summary portions of recently updated *NASA Research and Technology Operating Plans (RTOPs)*, and notices of non-NASA research projects that were funded in the most recent or current fiscal year. The latter are selected by SSIE. The project announcements in the insert are arranged by *STAR* divisions but are otherwise entirely separate from *STAR*. They are not indexed nor machine-searchable by NASA. Current and retrospective searches are available from SSIE, 1730 M Street, N.W., Washington, D.C. 20036.

SUBJECT SCOPE

Subject scope of *STAR*, *IAA*, and *On-Going Research Projects* includes all aspects of aeronautics and space research and development, supporting basic and applied research, and applications. Aerospace aspects of earth resources, energy development, conservation, oceanography, environmental protection, urban transportation, and other topics of high national priority are also covered.

OTHER NASA PUBLICATIONS

Other NASA publications and information services are described in the publication, *The NASA Scientific and Technical Information System...and How to Use It*, available without charge from the NASA Scientific and Technical Information Facility, P. O. Box 8757, B.W.I. Airport, Maryland 21240.

HOW TO USE STAR SUBJECT CATEGORIES

STAR is categorized by 10 major subject divisions divided into 74 specific subject categories and one general category/division. The major subject divisions are listed in the Table of Contents, together with a note for each that defines its scope and provides any cross-references. For example:

AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

Each major division is further divided into as many as nine specific categories, which are identified by category numbers.

Abstracts in *STAR* are grouped by specific category, the categories appearing in sequential order. Category breaks in the abstract section are identified by the category number and title, and a scope note. Cross-references to other categories are provided as appropriate. For example:

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*.

CROSS-REFERENCES

Individual *STAR* abstracts are not ordinarily cross-referenced, except for certain conference reports or book translations that have had separate abstracts written for their component papers or chapters. Citations and abstracts of the components follow immediately after those of the parent document. When the subject content of a component differs sufficiently from the general content of the parent, a cross-reference citation also is printed at the end of the category to which it normally would have been assigned if it were independent.

AVAILABILITIES

One or more sources from which a document announced in *STAR* is available to the public is given in each citation. The most commonly indicated sources and their acronyms or abbreviations are listed below. If the publication is available from a source other than those listed, the publisher and his address will be displayed on the availability line or in combination with the corporate source line.

Documents available on microfiche are designated by a pound sign (#) following the accession number. The pound sign is used without regard to the source or quality of the microfiche. Accession numbers followed by a plus sign (+) are not available on microfiche because of size or reproducibility.

Avail: NTIS. Sold by the National Technical Information Service. Prices for hard copy (HC) and microfiche (MF) are indicated by a price code following the letters HC or MF in the *STAR* citation. Current values for the price codes are given in the tables on page vii.

Microfiche [1] is available regardless of age for those accessions followed by a # symbol.

Initially distributed microfiche under the NTIS SRIM (Selected Research in Microfiche) is available at greatly reduced unit prices. For this service and for information concerning subscription to NASA printed reports, consult the NTIS Subscription Unit.

NOTE ON ORDERING DOCUMENTS: When ordering NASA publications (those followed by the * symbol), use the N accession number. NASA patent applications (only the specifications are offered) should be ordered by the US-Patent-Appl-SN number. Non-NASA publications (no asterisk) should be ordered by the AD, PB, or other *report* number shown on the last line of the citation, not by the N accession number. It is also advisable to cite the title and other bibliographic identification.

Avail: SOD (or GPO). Sold by the Superintendent of Documents, U.S. Government Printing Office, in hard copy. The current price and order number are given following the availability line. (NTIS will fill microfiche requests, at the standard $3.00 price, for those documents identified by a # symbol.)

Avail: NASA Public Document Rooms. Documents so indicated may be examined at or purchased from the National Aeronautics and Space Administration, Public Documents Room (Room 126), 600 Independence Ave., S.W., Washington, D.C. 20546, or public document rooms located at each of the NASA research centers, the NASA Space Technology Laboratories, and the NASA Pasadena Office at the Jet Propulsion Laboratory.

Avail: ERDA Depository Libraries. Organizations in U.S. cities and abroad that maintain collections of Energy Research and Development Administration reports, usually in microfiche form, are listed in *Nuclear Science Abstracts*. Services available from the ERDA and its depositories are described in a booklet, *Science Information Available from the Energy Research and Development Administration* (TID-4550), which may be obtained without charge from the ERDA Technical Information Center.

Avail: Univ. Microfilms. Documents so indicated are dissertations selected from *Dissertation Abstracts* and are sold by University Microfilms as xerographic copy (HC) and microfilm. All requests should cite the author and the Order Number as they appear in the citation.

Avail: USGS. Originals of many reports from the U.S. Geological Survey, which may contain color illustrations, or otherwise may not have the quality of illustrations preserved in the microfiche or facsimile reproduction, may be examined by the public at the libraries of the USGS field offices whose addresses are listed in this Introduction. The libraries may be queried concerning the availability of specific documents and the possible utilization of local copying services, such as color reproduction.

Avail: HMSO. Publications of Her Majesty's Stationery Office are sold in the U.S. by Pendragon House, Inc. (PHI), Redwood City, California. The U.S. price (including a service and mailing charge) is given, or a conversion table may be obtained from PHI.

(1) A microfiche is a transparent sheet of film, 105 by 148 mm in size, containing as many as 60 to 98 pages of information reduced to micro images (not to exceed 26:1 reduction).

Avail: BLL (formerly NLL): British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. Photocopies available from this organization at the price shown. (If none is given, inquiry should be addressed to the BLL.)

Avail: ZLDI. Sold by the Zentralstelle für Luftfahrtdokumentation und -Information, Munich, Federal Republic of Germany, at the price shown in deutschmarks (DM).

Avail: Issuing Activity, or Corporate Author, or no indication of availability. Inquiries as to the availability of these documents should be addressed to the organization shown in the citation as the corporate author of the document.

Avail: U.S. Patent Office. Sold by Commissioner of Patents, U.S. Patent Office, at the standard price of 50 cents each, postage free. (See discussion of patents and patent applications below.)

NASA PATENTS AND PATENT APPLICATIONS

Patents and patent applications owned by NASA are announced in *STAR* under appropriate subject categories and are referenced in the *STAR* indexes. In the Report/Accession Number Index, patents are indexed by the NASA Case Number (which appears in lieu of the report number in other indexes), the U.S. Patent Number, the U.S. Patent Application Serial Number, and the U.S. Patent Class. Patent applications for which patents have not yet been issued are indexed by the NASA Case Number and the U.S. Patent Application Serial Number.

NASA *patent application specifications* are sold in paper copy by the National Technical Information Service at price code A02 ($4.00 domestic, $8.00 foreign). Microfiche are sold at price code A01 ($3.00 domestic; $4.50 foreign). The US-Patent-Appl-SN- number should be used in ordering either paper copy or microfiche from NTIS. Printed copies of *patents* (which are not microfiched) are available for purchase at 50 cents per copy from:

Commissioner of Patents
U.S. Patent Office
Washington, D.C. 20231

When ordering patents, the U.S. Patent Number should be used, and payment must be remitted in advance, preferably by money order or check payable to the Commissioner of Patents. Prepaid purchase coupons for ordering are also available from the Patent Office. The patents and patent applications announced in *STAR* are owned by NASA and are available for royalty-free licensing. Requests for licensing terms and further information should be addressed to:

Assistant General Counsel for Patent Matters/Code GP-1
National Aeronautics and Space Administration
Washington, D.C. 20546

ELIGIBILITY AND REGISTRATION FOR NASA INFORMATION PRODUCTS AND SERVICES

A variety of services, in addition to the distribution of NASA scientific and technical reports and of *STAR* and its cumulative indexes, is available to organizations of the following types that have registered with NASA to receive specific services or products:

1. NASA offices, research centers, contractors, subcontractors, grantees, and consultants;

2. Other U.S. Government agencies and their contractors;
3. Libraries in the United States that have arrangements with NASA to maintain collections of NASA documents for public reference;
4. Other organizations in the United States having a need for NASA documents in work related to aeronautics and space research;
5. Organizations abroad that have established reciprocal document exchange arrangements with NASA.

Only the central service points or central points of document acquisition and control within qualified organizations are eligible to register for NASA products and services. Domestic organizations that may be eligible to receive various classes of NASA publications and services should address their requests for registration or for further information to:

NASA Scientific and Technical Information Facility
Attn.: Registration Activity
P.O. Box 8757
B.W.I. Airport, Maryland 21240

Organizations abroad should direct requests to the same address, but to the attention of: Foreign Exchange and Acquisitions Branch.

AVAILABILITY OF STAR ABSTRACTS ON MICROFICHE

Microfiche of the abstract sections of this issue and other issues of *STAR* are available on annual subscription from NTIS, Attn: Subscriptions, 5285 Port Royal Road, Springfield, Virginia 22161. Annual subscription rates are $45.00 North America; $90.00 foreign. Abstract sections for previous years retroactive to 1964 are available at the current rates. Microfiche for individual *STAR* issue abstract sections are not available.

ADDRESSES OF ORGANIZATIONS

American Institute of Aeronautics
and Astronautics
Technical Information Service
750 Third Ave.
New York, N.Y. 10017

British Library Lending Division,
Boston Spa, Wetherby, Yorkshire,
England

Commissioner of Patents
U.S. Patent Office
Washington, D.C. 20231

Energy Research and Development
Administration
Technical Information Center
P.O. Box 62
Oak Ridge, Tennessee 37830

ESA-Space Documentation Service
ESRIN
Via Galileo Galilei
00044 Frascati (Rome) Italy

Her Majesty's Stationery Office
P.O. Box 569, S.E. 1
London, England

NASA Scientific and Technical Information
Facility
P.O. Box 8757
B. W. I. Airport, Maryland 21240

National Aeronautics and Space
Administration
Scientific and Technical Information
Office (KSI)
Washington, D.C. 20546

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161

Pendragon House, Inc.
899 Broadway Avenue
Redwood City, California 94063

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

University Microfilms
A Xerox Company
300 North Zeeb Road
Ann Arbor, Michigan 48106

University Microfilms, Ltd.
Tylers Green
London, England

U.S. Geological Survey
1033 General Services Administration
Building
Washington, D.C. 20242

U.S. Geological Survey
601 E. Cedar Avenue
Flagstaff, Arizona 86002

U.S. Geological Survey
345 Middlefield Road
Menlo Park, California 94025

U.S. Geological Survey
Bldg. 25, Denver Federal Center
Denver, Colorado 80225

Zentralstelle für Luftfahrtdoku-
mentation und -Information
8 München 86
Postfach 880
Federal Republic of Germany

NTIS PRICE SCHEDULES

Schedule A

STANDARD PAPER COPY PRICE SCHEDULE

(Effective October 1, 1977)

Price Code	Page Range	North American Price	Foreign Price
A01	Microfiche	$ 3.00	$ 4.50
A02	001-025	4.00	6.00
A03	026-050	4.50	9.00
A04	051-075	5.25	10.50
A05	076-100	6.00	12.00
A06	101-125	6.50	13.00
A07	126-150	7.25	14.50
A08	151-175	8.00	16.00
A09	176-200	9.00	18.00
A10	201-225	9.25	18.50
A11	226-250	9.50	19.00
A12	251-275	10.75	21.50
A13	276-300	11.00	22.00
A14	301-325	11.75	23.50
A15	326-350	12.00	24.00
A16	351-375	12.50	25.00
A17	376-400	13.00	26.00
A18	401-425	13.25	26.50
A19	426-450	14.00	28.00
A20	451-475	14.50	29.00
A21	476-500	15.00	30.00
A22	501-525	15.25	30.50
A23	526-550	15.50	31.00
A24	551-575	16.25	32.50
A25	576-600	16.50	33.00
A99	601-up	-- 1/	-- 2/

1/ Add $2.50 for each additional 100 page increment from 601 pages up.

2/ Add $5.00 for each additional 100 page increment from 601 pages up.

Schedule E

EXCEPTION PRICE SCHEDULE

Paper Copy & Microfiche

Price Code	North American Price	Foreign Price
E01	$ 3.25	$ 6.50
E02	4.75	9.50
E03	6.25	12.50
E04	7.50	15.00
E05	9.00	18.00
E06	10.50	21.00
E07	12.50	25.00
E08	15.00	30.00
E09	17.50	35.00
E10	20.00	40.00
E11	22.50	45.00
E12	25.00	50.00
E13	28.00	56.00
E14	31.00	62.00
E15	34.00	68.00
E16	37.00	74.00
E17	40.00	80.00
E18	45.00	90.00
E19	50.00	100.00
E20	60.00	120.00

E99 - Write for quote

VOLUME 15 NUMBER 24/ DECEMBER 23, 1977

TABLE OF CONTENTS

AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

01 AERONAUTICS (GENERAL) 3165

02 AERODYNAMICS 3165

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*.

03 AIR TRANSPORTATION AND SAFETY 3169

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION 3170

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command and Tracking* and *32 Communications*.

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE 3171

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

06 AIRCRAFT INSTRUMENTATION 3173

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

07 AIRCRAFT PROPULSION AND POWER 3174

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion*.

08 AIRCRAFT STABILITY AND CONTROL 3179

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

09 RESEARCH AND SUPPORT FACILITIES (AIR) 3181

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

ASTRONAUTICS

Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

For related information see also *Aeronautics*.

12 ASTRONAUTICS (GENERAL) 3182

For extraterrestrial exploration see *91 Lunar and Planetary Exploration*.

13 ASTRODYNAMICS 3183

Includes powered and free-flight trajectories; and orbit and launching dynamics.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE) 3183

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research and Support Facilities (Air)*.

15 LAUNCH VEHICLES AND SPACE VEHICLES 3184

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

16 SPACE TRANSPORTATION 3185

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING 3187

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE 3187

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

19 SPACECRAFT INSTRUMENTATION 3187
For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

20 SPACECRAFT PROPULSION AND POWER 3188
Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.
For related information see also *07 Aircraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion*.

CHEMISTRY AND MATERIALS

Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; and propellants and fuels.

23 CHEMISTRY AND MATERIALS (GENERAL) 3188
Includes biochemistry and organic chemistry.

24 COMPOSITE MATERIALS 3188
Includes laminates.

25 INORGANIC AND PHYSICAL CHEMISTRY 3190
Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.
For related information see also *77 Thermodynamics and Statistical Physics*.

26 METALLIC MATERIALS 3195
Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 NONMETALLIC MATERIALS 3199
Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

28 PROPELLANTS AND FUELS 3203
Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.
For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion*.

ENGINEERING

Includes engineering (general); communications; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.
For related information see also *Physics*.

31 ENGINEERING (GENERAL) 3204
Includes vacuum technology; control engineering; display engineering; and cryogenics.

32 COMMUNICATIONS 3205
Includes land and global communications; communications theory; and optical communications.
For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking*.

33 ELECTRONICS AND ELECTRICAL ENGINEERING 3208
Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.
For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

34 FLUID MECHANICS AND HEAT TRANSFER 3213
Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.
For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

35 INSTRUMENTATION AND PHOTOGRAPHY 3219
Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.
For aerial photography see *43 Earth Resources*.
For related information see also *06 Aircraft Instrumentation* and *19 Spacecraft Instrumentation*.

36 LASERS AND MASERS 3221
Includes parametric amplifiers.

37 MECHANICAL ENGINEERING 3224
Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

38 QUALITY ASSURANCE AND RELIABILITY 3226
Includes product sampling procedures and techniques; and quality control.

39 STRUCTURAL MECHANICS 3226
Includes structural element design and weight analysis; fatigue; and thermal stress.
For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

GEOSCIENCES

Includes geosciences (general); earth resources; energy production and conversion; environment pollution; geophysics; meteorology and climatology; and oceanography.
For related information see also *Space Sciences*.

42 GEOSCIENCES (GENERAL) N.A.

43 EARTH RESOURCES 3229
Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography*.

44 ENERGY PRODUCTION AND CONVERSION 3235
Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.
For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation*.

45 ENVIRONMENT POLLUTION 3245
Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

46 GEOPHYSICS 3249
Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.
For space radiation see *93 Space Radiation*.

47 METEOROLOGY AND CLIMATOLOGY 3253
Includes weather forecasting and modification.

48 OCEANOGRAPHY 3257
Includes biological, dynamic and physical oceanography; and marine resources.

LIFE SCIENCES

Includes life sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and planetary biology.

51 LIFE SCIENCES (GENERAL) 3258
Includes genetics.

52 AEROSPACE MEDICINE 3266
Includes physiological factors; biological effects of radiation; and weightlessness.

53 BEHAVIORAL SCIENCES 3270
Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT 3270
Includes human engineering; biotechnology; and space suits and protective clothing.

55 PLANETARY BIOLOGY N.A.
Includes exobiology; and extraterrestrial life.

MATHEMATICAL AND COMPUTER SCIENCES

Includes mathematical and computer sciences (general); computer operations and hardware; computer programming and software; computer systems; cybernetics; numerical analysis; statistics and probability; systems analysis; and theoretical mathematics.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL) N.A.

60 COMPUTER OPERATIONS AND HARDWARE 3272
Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering*.

61 COMPUTER PROGRAMMING AND SOFTWARE 3273
Includes computer programs, routines, and algorithms.

62 COMPUTER SYSTEMS 3276
Includes computer networks.

63 CYBERNETICS 3276
Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support*.

64 NUMERICAL ANALYSIS 3277
Includes iteration, difference equations, and numerical approximation.

65 STATISTICS AND PROBABILITY 3280
Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

66 SYSTEMS ANALYSIS 3282
Includes mathematical modeling; network analysis; and operations research.

67 THEORETICAL MATHEMATICS 3283
Includes topology and number theory.

PHYSICS

Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy physics; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.
For related information see also *Engineering*.

70 PHYSICS (GENERAL) 3283
For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar Physics*.

71 ACOUSTICS 3283
Includes sound generation, transmission, and attenuation.
For noise pollution see *45 Environment Pollution.*

72 ATOMIC AND MOLECULAR PHYSICS 3285
Includes atomic structure and molecular spectra.

73 NUCLEAR AND HIGH-ENERGY PHYSICS 3286
Includes elementary and nuclear particles; and reactor theory.
For space radiation see *93 Space Radiation.*

74 OPTICS 3286
Includes light phenomena.

75 PLASMA PHYSICS 3287
Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics.* For space plasmas see *90 Astrophysics.*

76 SOLID-STATE PHYSICS 3291
Includes superconductivity.
For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

77 THERMODYNAMICS AND STATISTICAL PHYSICS 3293
Includes quantum mechanics; and Bose and Fermi statistics.
For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law and political science; and urban technology and transportation.

80 SOCIAL SCIENCES (GENERAL) N.A.
Includes educational matters.

81 ADMINISTRATION AND MANAGEMENT 3293
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE 3294
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software.*

83 ECONOMICS AND COST ANALYSIS 3295
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE N.A.
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 3296
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) N.A.

89 ASTRONOMY 3298
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 3298
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 3299
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 3300
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 3301
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

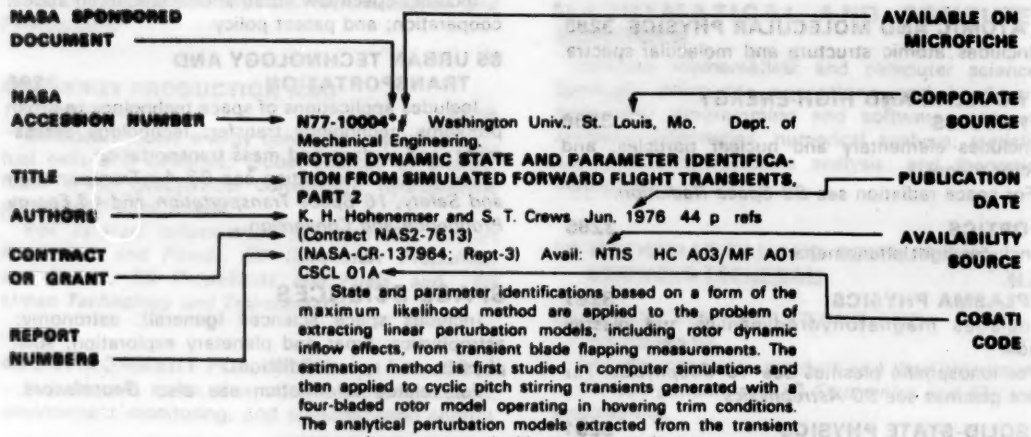
GENERAL

99 GENERAL N.A.

Note: N.A. means that no abstracts were assigned to this category for this issue.

SUBJECT INDEX I-1
PERSONAL AUTHOR INDEX I-47
CORPORATE SOURCE INDEX I-55
CONTRACT NUMBER INDEX I-69
REPORT/ACCESSION NUMBER INDEX I-73

TYPICAL CITATION AND ABSTRACT



N77-10004*# Washington Univ., St. Louis, Mo. Dept. of Mechanical Engineering.

ROTOR DYNAMIC STATE AND PARAMETER IDENTIFICATION FROM SIMULATED FORWARD FLIGHT TRANSIENTS. PART 2

K. H. Hohenemser and S. T. Crews Jun. 1976 44 p refs

(Contract NAS2-7613)

(NASA-CR-137964; Rept-3) Avail: NTIS HC A03/MF A01

CSCL 01A

State and parameter identifications based on a form of the maximum likelihood method are applied to the problem of extracting linear perturbation models, including rotor dynamic inflow effects, from transient blade flapping measurements. The estimation method is first studied in computer simulations and then applied to cyclic pitch stirring transients generated with a four-bladed rotor model operating in hovering trim conditions. The analytical perturbation models extracted from the transient test results are compared with transient and frequency response tests not used in the state and parameter identification. The identified analytical perturbation model is also compared with a simple theory. The method that is applicable both to small scale and full scale dynamic rotor testing is being extended to perturbations from forward flight trim conditions. Author

ON-GOING RESEARCH PROJECTS

This is a listing of research projects – not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power; Aircraft Stability and Control; and Research and Support Facilities (air). For Related Information See Also Astronautics.

1.0001, EVALUATION OF A PRESSURIZED AIR START SYSTEM FOR ADVANCED ARMY HELICOPTERS

J. RHODEN, Signal Companies Incorporated, *Phoenix, Arizona* 85034 (DA0D4098; DAAJ02-77-C-0007)

The pressurized air start system (PASS) concept has been evaluated for starting gas turbine engines that currently use electric starters in conjunction with nickel-cadmium batteries and offers several advantages. The objective of this study is to investigate the concept in further detail prior to an advanced or engineering hardware development program.

Preliminary evaluation has shown that the pressurized air start system (PASS) offers several advantages over current electric start systems used on helicopters. The primary advantages are its inherent low temperature capability (minus 25F and below), combined with a significant weight reduction to the aircraft. The evaluation to date has been based primarily on weight, performance, and cost parameters. To fully evaluate the potential advantages of the system, a more detailed study of other parameters is necessary. Requiring further analysis are: (1) aircraft installation considerations, (2) maintenance, (3) reliability, (4) life cycle cost, (5) logistics, (6) vulnerability. The Advanced Scout Helicopter (ASH) will be used as the basis for the evaluation. This will allow identification of mission requirements, propulsion engine size or model, ambient requirements (temperature and altitude), etc., in order to make comparisons and evaluations using actual data rather than assumed values or subjective comparisons.

ADDENDA: Supporting agency address is: AVSCOM Air Mobility R&D Lab, Eustis Dir, Ft Eustis VA 23604.

SUPPORTED BY U.S. Dept. of Defense, Army

1.0002, OPTIMAL COMPUTER-AIDED CONTROL ANALYSIS/SYNTHESIS METHODS

R.F. WHITBECK, Systems Technology Inc., *Hawthorne, California* 90250 (DF139470; F33615-77-C-3026)

Current design practice for digital flight control systems is to first develop a good analog design and then emulate it digitally. This leads to high sample rate systems with problems of computation time delays, excessive word length requirements and internal noise. One dominant reason for the current design procedure is reliance on system design criteria postulated for analog systems. The objective of this effort is to develop flight control design criteria applicable to direct digital design theory in order to take better advantage of digital system characteristics. Flying qualities and the total system's sensitivity to uncertainty in definition of the airplane's characteristics are dormant considerations in the development of new design criteria for digital systems. This effort will provide design criteria for future military aircraft flight controls that will insure optimum use of digital flight control advantages, considering both cost and performance, while providing adequate flying qualities for the mission.

The latest direct digital design methodologies including discrete optimal control theory will be reviewed and codified regarding their applicability to the design of complex aircraft flight controls. Various sampling rates and types of sampling as well as different types of data holds will be considered. Current flying qualities design criteria will be reviewed and evaluated with respect to their applicability or compatibility with digital control design theory. Revision or replacement of flying qualities criteria will be recommended where possible. Research to develop new criteria or merge flying qualities and digital control criteria will be defined where necessary. Proposed new or revised design criteria will be validated by application to realistic advanced flight control design problems and evaluation of the results.

ADDENDA: Supporting agency address is: AF Flight Dynamics Laboratory FGC, Wright-Patterson AFB, Ohio 45433.

SUPPORTED BY U.S. Dept. of Defense, Air Force

1.0003, AIRCRAFT TRANSPARENCY FAILURE AND COST ANALYSIS

W.D. DOTSETH, Rockwell International Corp., *Los Angeles, California* 90009 (DF140130; F33615-77-C-3060)

The logistics or ownership cost of current aircraft transparency systems varies radically for each new system and cannot be accurately predicted. This is not only true for the replacement costs but also for the initial development costs where different design concepts are being considered. The costs are highly sensitive to the particular design configuration. The objective of this effort is to define the most significant design parameters affecting the logistics costs of aircraft transparency systems for current inventory aircraft and project the ownership costs for future systems such as the B-1 and F-16. Corrective programs to reduce AFLC support costs will be recommended.

An initial data search utilizing current AFLC data systems has yielded work unit code reliability, maintainability and logistics support cost information on 20 aircraft transparency systems. The approach is to conduct a combined USAF and contractor field audit at the AFLC AMA's to correlate the initial data search information with actual field experience. Hardware design information, design and test requirements and certification/qualification test results will be collected for each of the systems. A resulting analytical analysis will be conducted to establish the failure/cost relationships with the transparency design parameters.

ADDENDA: Supporting agency address is: AF Flight Dynamics Laboratory FER, Wright-Patterson AFB, Ohio 45433.

SUPPORTED BY U.S. Dept. of Defense, Air Force

1.0004, DEVELOPMENT OF MODEL TO ASSESS ENVIRONMENTAL EFFECT OF COMMERCIAL AVIATION'S HIGH-ALTITUDE CRUISE OPERATIONS

UNKNOWN, U.S. Air Force, Space & Missile Systems Org., *Los Angeles, California* 90009 (FA77WAI-720; FA59977 (TRAIS NO.))

The objective is to develop a model for use in assessing the environmental effect of commercial aviation's high-altitude cruise operations. Since present fleets are too small, it is impossible to measure the environmental effects of aircraft exhaust products. Therefore, it is necessary to use mathematical models of atmospheric transport and chemistry to derive the required understanding.

SUPPORTED BY U.S. Dept. of Transportation, Office of the Secretary

1.0005, CLEANING OF FAA AIRCRAFT AND RELATED GROUND SUPPORT EQUIPMENT
A.J. JANSEN, Solano Aircraft Service Inc., *Vacaville, California* 95688 (FA76NA-3031; FA59304 (TRAIS NO.))

SUPPORTED BY U.S. Dept. of Transportation, Office of the Secretary

1.0006, ANALYTICAL MODEL OF A JET-DIFFUSER EJECTOR FOR WATER PROPULSION
M. ALPERIN, Flight Dynamics Research Corp., *Van Nuys, California* 91406 (DN775403; N00014-77-C-0294)

To formulate an analytical model of a jet-diffuser ejector.

Derive the relationships to predict the performance of a two-dimensional jet-diffuser ejector in motion in its thrust direction for incompressible flow including the effects of cavitation and viscous dissipation within the ejector.

ADDENDA: Supporting agency address is: Office of Naval Research Arlington, VA 22217.

SUPPORTED BY U.S. Dept. of Defense, Navy

1.0007, AN INVESTIGATION OF IMPROVED AIRPLANE MANEUVERING CAPABILITIES
J.D. LANG, U.S. Air Force, Frank J. Seiler Res. Lab., *Colorado Springs, Colorado* 80840 (DF282200)

AF function - counterair. Deficiency - existing non-steady aerodynamic theory has not been fully applied to aircraft performance and maneuvering problems. Research - an investigation will be undertaken to determine the feasibility of applying existing non-steady aerodynamic theory, especially dynamic stall effects, with emphasis on expanding the maneuver envelope. How research contributes - will result in improved airplane performance and optimized maneuver tactics.

Initially, emphasis will be placed on adapting techniques to existing aircraft configurations. Consideration will then be given to identify airplane configurations which will yield further improvements in maneuvering performance. Several experiments may be designed to test ideas for configurations and/or to test the validity of analytical results. The ultimate objective is to identify those airplane configurations, and associated control techniques which will result, in fact, in achieving 'best' maneuvering capabilities.

ADDENDA: Supporting Agency address is: Frank J Seiler Research Lab NH, USAF Academy, Colo 80840.

SUPPORTED BY U.S. Dept. of Defense, Air Force

1.0008, STUDY OF P&W AIRCRAFT JT8D JET NOISE REDUCTION
UNKNOWN, United Technologies Corp., *Hartford, Connecticut* 06108 (FA59145; FA76WA-3809)

A scale-model JT8D exhaust nozzle system incorporating an internal mixer shall be designed, fabricated, and tested under simulated JT8D engine exhaust flow conditions. A model coannular JT8D exhaust without a mixer will be tested to determine the JT8D baseline jet noise, and a single jet will be tested at conditions representing 100 percent mixing to determine the maximum potential for jet noise reduction.

SUPPORTED BY U.S. Dept. of Transportation, Office of the Secretary

1.0009, DESIGN DEFINITION STUDY FOR MICROWAVE LANDING SYSTEM
UNKNOWN, Bendix Corporation, *Baltimore, Maryland* 21204 (FA59352; FATQWA-3827)

The expanded microwave landing system is a precision approach and landing navigation equipment capable of supporting ICAO Category I, II or III operational objective. The expanded MLS shall be capable of providing approach, departure, and missed approach angle guidance, rollout, distance information, and auxiliary data to any suitably equipped aircraft. The quality of such information shall be adequate to support operational objectives when all other radio communication with the aircraft is lost during the approach.

SUPPORTED BY U.S. Dept. of Transportation, Office of the Secretary

1.0010, RELIABILITY-BASED SCATTER FACTORS
M. SHINOZUKA, Modern Analysis Incorporated, *Ridgewood, New Jersey* (DF139970; F33615-77-C-3055)

There is a requirement to establish design procedures for assessing minimum life of aircraft details at a given reliability value to assure compliance with economical service life and safe life requirements. When either designing experiments or utilizing experimental data to compare or evaluate aircraft details and construction procedures, considering both mean life and scatter is important as both affect the time to first failure. The objective of this effort is the development of procedures for evaluating and the actual evaluation of scatter factors for predicting times to first failure at a given reliability value for a given number of aircraft details from fatigue data on a given number of specimens tested to similar conditions. The results of this effort will permit designing experiments and comparing results to obtain the proper selection of aircraft details and construction procedures and to estimate in-service performance.

Distributions of times or numbers of cycles to produce fatigue cracks tend to be Weibull. Given the number of details to be considered, time or number of cycles to first cracking can be determined with a given confidence or reliability by estimating the parameters of a Weibull distribution from the test data. The time to first failure is evaluated from the distribution for time to first failure. This distribution is also Weibull and the parameters can be established from the parameters estimated for the distribution if times to fatigue cracking. The influence of scatter in the estimates of these parameters due to the finite number of fatigue tests must be included in the evaluation. The time to first failure at a given reliability value can be determined from a scatter factor by which the estimate for the scale parameter can be divided to obtain this time. During this effort, a procedure for establishing the effects of scatter in the parameter estimation will be developed using Monte Carlo simulation techniques. This procedure and the relationship between parameters of the distribution of times to failure and times to first cracking of a given number of details will be used to evaluate scatter factors for different numbers of tests, details considered and reliability values.

ADDENDA: Supporting agency address is: AF Flight Dynamics Laboratory FBRD, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense, Air Force

1.0011, SERVICE EVALUATION OF F-14 COMPOSITE OVERWING FAIRINGS
R. CARLSON, Grumman Corporation, *Bethpage, New York* 11714 (DN681283; N62269-75-0449)

To demonstrate the service durability and structural reliability of advanced fiber-reinforced composite aircraft structures under actual Navy operational usage. To determine the reproducibility of such structures when produced by a pilot-production program and to provide realistic manufacturing cost data which can be used as a basis for future economic projections. This work is in support of WU ZA101, Aircraft Technology, agency accession no. DN 681080.

A limited-production quantity (5 ship-sets) of F-14 composite overwing fairings will be manufactured using pilot-production practice and techniques. These composite fairings were originally designed and developed under NaVair contract N00019-73-A-0070, and tested at the NavAirDevCen. The manufacturing methods used will simulate large-scale production techniques; the quality of the fairings so produced will be assessed, manufacturing costs will be closely monitored, and learning-curve predictions will be verified. The composite fairings will be installed on F-14 aircraft in fleet service, and subjected to a variety of service usage and operating environments; their condition will be periodically monitored during the life of the aircraft. (The present contract covers only the manufacture of the fairings, not their service evaluation.)

ADDENDA: Supporting agency address is: Naval Air Development Center Air Vehical Technology Dept, Warminster PA

SUPPORTED BY U.S. Dept. of Defense, Navy

1.0012, HIGH-ANGLE-OF-ATTACK SEPARATED FLOWS
T.J. CORD, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433 (DF140870)

Current Air Force fighter aircraft exhibit dangerous stall/post-stall characteristics which limit combat effectiveness and may cause loss of both aircraft and crew. Criteria based on the aerodynamic characteristics of the aircraft are being developed for use in the early design phase of future systems. The objective of this effort is to develop a fundamental understanding of the separated aerodynamic flow associated with high-angle-of-attack flight dynamics and determine suitable input to design criteria. The results of this effort help to understand the high-angle-of-attack dynamic problem thus allowing solutions to be found which will increase combat effectiveness and safety of flight for future fighter/attack aircraft. The mission to be supported is FG02, development and improvement of flight control design techniques.

A number of digital computer programs with six degrees of freedom will be used to study the sensitivity of loss of control to aerodynamic variables which may be affected by flow separation. Wind-tunnel test will be planned and conducted in conjunction with AEDC, to provide improved aerodynamic math models for high-performance aircraft.

ADDENDA: Supporting agency address is: AF Flight Dynamics Laboratory FGC, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense, Air Force

1.0013, CREW STATION DESIGN FACILITY FEASIBILITY STUDY
J.A. UPHAUS, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433 (DF136150)

Research requirements have been generated in recent AF Flight Dynamics Laboratory contracts to define display legibility and crew station control/display problem areas. It is apparent that a considerable amount of additional effort must be expended to provide better control/display design criteria for AF fighter aircraft cockpits and thus to provide significant increases in safety and mission effectiveness during military operational flying. A test facility capable of simulating the broad range of extreme illuminance conditions experienced in air-to-air combat, air-to-ground weapons delivery, and other high-workload tasks is required to successfully design and evaluate advanced integrated crew stations composed of multi-purpose displays and multi-function controls. This facility would also be utilized by crew station design teams to correct display deficiencies in advance of production and thereby guarantee mission performance and lower life cycle costs for display systems.

This effort is the initial phase in the development of a crew station design facility. A feasibility and design study to define trade-offs, technical limitations and overall design of the test facility will be contracted. The study will provide information concerning description, location, type of simulated features (such as air targets, ground targets, flares, and extreme ambient illumination sources) and the simulator enclosure itself. The results of the study will be used in a future detailed design study preliminary to construction of the facility.

ADDENDA: Supporting agency address is: AF Flight Dynamics Laboratory FGR, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense, Air Force

1.0014, ANALYSIS OF LOW-SPEED HELICOPTER FLIGHT TEST DATA
G.A. SHOCKEY, Bell Helicopter Company, *Fort Worth, Texas* 76101 (DA0D4107; DAAJ02-77-C-0022)

To investigate the aerodynamic and dynamic behavior of a helicopter operating in the low-speed flight regime particularly in the NOE evasive mode.

Effort will consist of reducing and analyzing existing AH-1G flight test response data acquired for simulated NOE maneuvers.

ADDENDA: Supporting agency address is: AVSCOM Air Mobility R&D Lab, Eustis Directorate, Ft Eustis VA 23604

SUPPORTED BY U.S. Dept. of Defense, Army

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, MATERIALS SUPPORT TECHNOLOGY - DIMENSIONAL STABILITY AND MICROCREEP BEHAVIOR OF GYRO-STRUCTURAL MATERIALS
A.W. RUFF, U.S. Dept. of Commerce, Natl. Bureau of Standards, *Washington, District of Columbia* 20234 (DN775553; N00014-77-F-0041)

The overall objective of this program is to apply materials research to gryo-structural materials used in the inertial measurement units that provide guidance and control to space vehicles and missiles. The immediate goals are (1) to measure static dimensional stability and microcreep behavior of gyro-structural beryllium alloys and (2) to investigate the causes and mechanisms responsible for microdeformation of these materials. The first part calls for extremely small and accurate measurements of strain distortion with a precision of plus or minus ten to the minus seven initially and plus or minus ten to the minus eight in the second year. The second part requires detailed and comprehensive microstructural characterization and accurate analyses of chemical composition, which will be correlated to provide an explanation for the measured strain distortion and microcreep. The work will be coupled to related work groups at the Draper Laboratory.

Initial measurements will be made on commercial Be-6 weight percent oxygen alloys. Microcreep will be measured using displacement transducers. An optical displacement measuring technique will be developed and debugged to permit future measurements at plus or minus ten to the minus eight. A holographic/interferometric displacement measuring and loading system will be designed and built to measure deformations of a hydrostatically loaded structural shape of simple geometry. Assorted microstructural studies and chemical analyses will be carried out on test materials both As-prepared and As-deformed.

ADDENDA: Supporting agency address is: Office of Naval Research Arlington, VA 22217

SUPPORTED BY U.S. Dept. of Defense, Navy

3.0002, PHOTOCHEMISTRY OF JP-4
D.A. STONE, U.S. Air Force, Civil & Environ. Eng. Dev. Agy, *Panama City, Florida* 32401 (DF409600)

To determine the photochemical reactivity of JP-4 released into the atmosphere from aircraft fuel dumping, or from transportation and storage operations. This work is a continuation of work begun under JON 19004C02, and has been separated from 19004C02 for management optimization reasons. The data obtained will feed the technical data base and provide information for future impact assessments.

A reaction chamber will be used to simulate actual conditions. JP-4 (or representative components) will be combined with nitrogen oxides and irradiated with ultraviolet light. Product identification and reaction kinetics determinations will be accomplished, instrumentally, mainly by using long-path infrared spectroscopy.

ADDENDA: Supporting agency address is: AF Civil Engineering Center EVC, Tyndall AFB, FLA 32401

SUPPORTED BY U.S. Dept. of Defense, Air Force

3.0003, FLOW AND FRACTURE PROCESSES IN POWDER METALLURGICAL NICKEL-BASE SUPERALLOYS
M.J. BLACKBURN, United Aircraft Corporation, *West Palm Beach, Florida* 33402 (DF047550; F49620-77-C-0083)

AF function - nickel-base superalloys, because of their unique high-temperature properties, find extensive application in the turbine section of gas turbine engines. Opportunity - as the performance requirements of such aerospace power plants become more demanding, the material properties must be improved to compensate for the more severe operating conditions. However, the specific property improvements required in an alloy depend upon the component for which it is to be used. For the air-

foil section of a blade, high-temperature creep and rupture properties coupled with good thermal fatigue resistance are critical properties. For a turbine disk, which operates at lower temperature, improved engine performance translates into requirements for higher strength materials with superior stress rupture characteristics. Objective - this research will obtain insight into the factors and mechanisms that control the strength and stress-rupture properties of powder metallurgy nickel-base superalloy disks fabricated by hot isostatic pressing. How work contributes - as such, it will contribute to AF programs to exploit advanced cost-effective manufacturing methods (hot isostatic pressing of nickel alloy powders) for the production of critical engine components.

Two basic mechanical properties of nickel-base superalloys fabricated by powder metallurgy techniques have been selected for study - stress rupture, and strength with emphasis on the yield stress. Several alloy compositions, including MERL-76, will be selected for detailed mechanical and microstructural characterization. Quantitative models will be constructed of the mechanical processes, and related to experimental observations.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NE Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

3.0004, PARAMETERS AFFECTING THE PREPARATION OF 3-FLUOROSALICYLALDEHYDE VIA THE REIMER-TIEMANN REACTION

P.A. PINKE, Univ. Oil Products Company, *Des Plaines, Illinois* 60016 (DF049110; F49620-77-C-0104)

AF function - critical subsystems and components and their interactions are vital to the successful accomplishment of the AF flight vehicle mission. Deficiency - improved methods are needed for converting starting materials and intermediates into compounds such as fluomine which are needed in oxygen generating systems. Objective - the objective of this research is to study the parameters affecting the Reimer-Tiemann reaction whereby 3-fluorosalicylaldehyde is made, thus increasing the yield of compound for use in making fluomine. How work contributes - the work should provide information leading to a more readily available and less expensive source of fluomine for use in oxygen generating systems in military aircraft.

In order to increase the selectivity of the Reiman-Tiemann reaction in the synthesis of 3-fluorosalicylaldehyde the non-aqueous modification of the reaction will be systematically studied in order to maximize the levels of O-fluorophenol conversion and 3-fluorosalicylaldehyde selectivity.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NC Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

3.0005, MODELLING THE DEFLAGRATION-TO-DETONATION TRANSITION IN REACTIVE SOLID PARTICLE-GAS MIXTURES

H. KRIER, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801 (DF046070; AF-AFOSR-3115-77)

AF function - the MX missile will use high-energy HMX propellants. Deficiency - the Navy C-4 missile uses similar propellants and has experienced unscheduled detonations. Objective - this research will develop a general but accurate criterion of when deflagration-to-detonation transition (DDT) occurs in granulated solid propellants. How work contributes - permits the design of safe, reliable, high-performance missile weapons systems.

This work will include: (a) an analysis of the proper relations to express both the gas-particle drag interaction, as well as the particle-particle interaction during the non-steady, accelerating flows which occur as the flame (convective) front transits into a shock, (b) a formulation of a rigorous criterion for DDT that can be utilized unambiguously with a theoretical code which predicts pressure, velocity and flame front histories, (c) suggestions for the appropriate experiments which could eventually be carried out to verify the hazard predictions of the theoretical solutions, (d) an analysis of detonation run-up length as a function of propellant energy content, granulated loading density, an average particle size, burning rate properties, exterior wall distribution of the crack which contains the grandlated bed, and (e) a better numerical integration scheme which allows shock waves imbedded in the flow.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NA Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

3.0006, EFFECTS OF LARGE DEFORMATION FLOW AND FRACTURE ON LIFE PREDICTION

T.P. RICH, U.S. Army, Materials & Mechanics Res. Ct., *Watertown, Massachusetts* 02172 (DA0F4720)

The objective of this project is to derive, develop, and automate new analytical/computer techniques which are required to evaluate the role of non-linear deformations in life prediction technology. Specifically, two important life prediction problems, which are deformation controlled, will be addressed this fiscal year: (1) analysis of standard axisymmetric hardness test, (2) stress intensities under partial crack closure. Both of these problems will enable the development of algorithms for handling non-linear aspects of mechanical deformations--algorithms which are essential to an eventual successful overall capability in large deformation metal flow and fracture. Attainment of this objective will provide immediate support in the pacing area of improved methods of linear and non-linear stress analysis with currently identifiable application in such program thrust areas as aircraft survivability.

The solution of the hardness test configuration for a spherical indentor and a flat specimen will be performed with METFLO, an elastic-plastic, large deformation finite-element code recently developed under this ongoing project at AMMRC. This problem will serve to focus development of rezoning techniques within METFLO, which are necessary for applications with understanding in in-house efforts in the area of metal flow mechanics. The second problem, crack closure, will be tackled for the case of radial cracks emanating from stress concentrations as found in recent test configurations for the assessment of ballistic tolerance. The method of solution will follow a complex variable approach.

ADDENDA: Supporting agency address is: DARCOM Materials & Mechanics Res Center, Attn- DRXMR-TM, Watertown MS 02172

SUPPORTED BY U.S. Dept. of Defense, Army

3.0007, LINEAR AND NONLINEAR SPECTROSCOPIC STUDIES OF OH, H2O, AND HO2

J.F. WARD, Univ. of Michigan, School of Lit. Sci. & The Arts, *Ann Arbor, Michigan* 48104 (ATM75-06954 A04)

This research is aimed at a fundamental understanding of laser induced fluorescence of OH, and at exploring extensions of this technique for studying other molecules. Recently successful application of this technique has allowed, for the first time, detection of OH concentrations in ambient air. This success is of great interest in controlling the balance of carbon monoxide in nature. A fundamental understanding of the spectroscopic processes involved will be both scientifically interesting and useful.

This technique laser-of induced fluorescence will be used to study the non-equilibrium population distribution among the rotational levels of OH. This allows a detailed determination of the approach toward equilibrium in flames and other high-temperature media. It has demonstrated that this technique offers unprecedented temporal and spatial resolutions. The relevance to combustion processes gives this study practical as well as fundamental relevance.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

3.0008, PASSIVE FILMS ON METALS

R.W. STAEHLE, Ohio State University, School of Engineering, *Columbus, Ohio* 43212 (DMR76-20807)

This is a continuation of a program to develop predictive theories of passivity to describe quantitatively the effects of alloying and environmental influences. Surface analysis techniques are employed to identify electronic and compositional factors critical to passivity, and those changes which result in its breakdown. Iron-chromium, iron-molybdenum, and iron-chromium-molybdenum systems exposed to one normal sulfuric acid and acid chloride solutions are under study because of their technological

importance and because they exhibit two types of beneficial alloying effects: (1) the critical 12% chromium concentration necessary for passivity; and (2) the synergistic chromium-molybdenum interactions. Results obtained to date indicate that the bonding at the metal-oxide interface and the electronic defect structure of the film may play a dominant role. Hence, following characterization of the films, initial attempts at developing a model will center on the application of chemisorption theories, and those describing the electronic properties of semiconductors and heterogeneous junctions. This is a renewal of NSF Grant DMR74-08061.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

3.0009, MECHANISTIC BEHAVIORAL STUDIES OF WELDED STRUCTURAL STEEL UNDER STRESS CORROSION ENVIRONMENTAL EFFECTS

V. DAMIANO, Franklin Inst. of State of Pa., *Philadelphia, Pennsylvania* 19103 (DF048780; AF-AFOSR-3341-77)

AF function - Air Force flight vehicles are fabricated using complex, mixed materials that each exhibit different reactions to environmental effects. In order to improve the serviceability of Air Force vehicles, research should now be done to better understand the role of selected environs during the phenomenalistic problem of stress corrosion. Opportunity - the combined effects of stress and corrosion on the loss of ductility and stiffness for exploratory Air Force steels is an unknown area that requires scientific exploitation. For example, the stress corrosion behavior of AF-1410 steel has not been properly evaluated and the problem is of real concern to airplane designers for the long term. Research in this area would provide much needed answers to questions that are vital to the life cycle service of aerospace structures fabricated of AF-1410 steel. Objective - this proposed work is to compare the stress corrosion susceptibility of AF-1410 parent material, heat-affected zones and weldments in both aqueous and gaseous environments using a fracture mechanistic approach. How work contributes - the research would contribute to the AFOSR mission in the area of a continuing effort on problems relating to fatigue, fracture and environmental effects in the field of structural materials mechanics.

Experimentally this program will consider these variables of stress corrosion - sample location and condition, aqueous and gaseous susceptibility, method of testing, welding variables and cathodic polarization. Analytically, the data will be characterized using fractography and in situ stress corrosion cracking observations so that models may be developed to predict, prevent and control the problem of stress corrosion.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NA Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

3.0010, SOLID PROPELLANT ADDITIVES FROM PENTABORANE-9

A.J. LEFFLER, Villanova University, School of Liberal Arts & Sci., *Villanova, Pennsylvania* 19085 (DF048380; AF-AFOSR-3301-77)

AF function - future Air Force needs include rockets with improved performance, reliability and durability for a broad range of mission applications. Deficiency - progress in solid propellant technology requires additional basic understanding and acquisition of materials better tailored to propulsion goals. Objective - the purpose of this research is to find suitable means of converting pentaborane-9 into stable solid propellant additives. How work contributes - the work will provide methods for converting presently available chemical substances into useable additives.

Two approaches will be studied. The first is either to convert pentaborane into reactive species by electrochemical oxidation or reduction, or to react the pentaborane with electrochemically generated species. The second is to study the incorporation of pentaborane into metalloorganic structures by either introduction of the B5H8 group into an existing structure such as ferrocene, or by incorporating the B5H8 group into components and building the final structure from these components.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NC Bldg 410, Bolling AFB, dc 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

3.0011, DEVELOPMENT AND PRACTICAL APPLICATION OF THE THEORY OF MATERIALS

J.R. VANWAZER, Vanderbilt University, School of Arts & Sciences, *Nashville, Tennessee* 37232 (DF046680; AF-AFOSR-3145-77)

AF function - Air Force flight operations have continuing needs for improved structural and environment resistant materials. Deficiency - a need exists for methods to predict the best approaches for making new materials. Objective - the research deals with the development and practical application of the theory of materials to problems of importance to the Air Force. How work contributes - the work will provide a basis for the synthesis of desirable new materials without having to depend entirely on trial and error experimental procedures.

The research is concerned with the development and investigation of improved methods for theoretical calculations of practical value, dealing with the structure and properties of predominantly nonmetallic materials. Emphasis will be on practical extensions of recent findings concerning the use of pseudopotential theory in molecular calculations (the Nocor method). The proposed studies include (a) comparing various alternative ways of establishing the core-potential functions in order to find the best method, (b) inclusion of several configurations in the calculations on a given state of a molecule and (c) extension to open-shell molecules. Extension of the Nocor method to organic and inorganic polymer structures by employing periodic boundary conditions will be explored.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NC Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

3.0012, RADIATION CHEMISTRY AND MASS SPECTROSCOPY OF HIGH POLYMERS

M. DOLE, Baylor University, School of Arts & Sciences, *Waco, Texas* 76703 (K-099F)

The equations which we have developed for describing the kinetics of chain allyl free radical decay in irradiated polyethylene in terms of two non-interacting populations of free radicals reacting according to second-order kinetics have been successfully applied to a number of polyethylenes of different morphologies. The equations appear also to be applicable to free radical decay in irradiated crystalline amino acids. Hydrogen solubility studies have been continued with the unexpected result of no measurable hydrogen solubility in freeze-dried single crystals of polyethylene despite a marked catalytic effect of hydrogen in accelerating the decay of alkyl radicals in the freeze-dried sample.

Further studies of gas-phase macroions have been carried out using the plasma chromatograph. High mass peaks have been observed in the current-drift time curves, but these peaks (a) seem to bear no understandable relationship to the mass of the macromolecules studied (b) decrease in intensity and become broader at higher temperatures and (c) also decrease in intensity and broaden out at low carrier gas flow rates. These effects are not understood at the present time.

SUPPORTED BY Robert A. Welch Foundation

3.0013, EFFECT OF HIGH PRESSURE ON LAYERED COMPOUNDS

H.T. HALL, Brigham Young University, School of Biol. & Agric. Sci., *Provo, Utah* 84601 (DMR76-82421)

It is common practice to describe many types of inorganic crystal structures as layers of close-packed or nearly close-packed atoms. The sequence in which these layers are stacked may be altered by the application of very high pressures. Preliminary experiments have indicated that the variation of stacking sequence with pressure may be predictable by consideration of the relative compressibilities of the constituent atoms. The present investigation is concerned with the effect of very high pressure on the crystal structures of a variety of different binary compounds including those of the AB3 type. The data gained from this work will be used to establish or reject the suggestion that stacking sequence variations with pressure may be predicted from compressibility data.

This is a continuation of work supported by DMR72-03051 and is the first year of a two-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

3.0014, MAGNETOOPTIC STUDIES OF THE ELECTRONIC PROPERTIES OF METALS
E.H. STERN, Univ. of Washington, Graduate School, *Seattle, Washington* 98105 (DF039850; AF-AFOSR-2779-75)

Metals and their alloys serve many aerospace functions, not only as structural materials but also as solid-state electronic materials. This research studies the interaction of electromagnetic radiation, including the infrared and soft X-ray spectral region, with ordered and disordered metals and alloys as a function of temperature. The magnetooptic Kerr effect (MOKE) is used to measure the temperature variation of the exchange splitting with incident photon energy in the infrared. Measurements in the soft X-ray region, using the synchrotron radiation source at Stanford Linear Accelerator, are being made on ferromagnetic metals such as Ni. The polar reflection Faraday effect (PRFE) is used to determine the electronic structure of highly disordered metallic alloys such as AgSn and AgCu and on slightly disordered systems, such as AgAu and AgCd. These experimental measurements require careful analyses and theoretical interpretations.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NE Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, FLUIDIC TECHNOLOGY INVESTIGATIONS - RATE SYSTEM FOR 2.75 INCH ROCKET
J.C. DUNAWAY, U.S. Army, Guidance & Control Directorate, *Huntsville, Alabama* 35809 (DA0F1300)

The object of this program is to develop a low-cost fluidic rate control system to limit the dispersions of the 2.75 rocket system when fired from the harsh environment of a hovering helicopter.

A fluidic laminar rate sensor and a level detector circuit will be designed and breadboarded. A thrust vector control scheme will be developed and integrated with the rate sensor circuit. Static test will be conducted to demonstrate the systems operation.

ADDENDA: Supporting agency address is: Darcom Harry Diamond Laboratories, 2800 Powder Mill Road, Adelphi MD 20783

SUPPORTED BY U.S. Dept. of Defense, Army

4.0002, THE RESONANCE PHENOMENON OF A JET IMPINGING ON A SOLID BOUNDARY
C. HO, Univ. of Southern California, Graduate School, *Los Angeles, California* 90007 (DF048550; AF-AFOSR-3312-77)

AF function - advanced aerospace vehicles. Opportunity - when a solid surface is located closer than six jet diameters from a high subsonic (above Mach equals 0.6) a resonance phenomenon appears in the form of increased noise level and increased energy transfer from the jet to the solid surface. The present theories are incomplete and inadequate to explain this phenomenon. The large-scale coherent structure shed from the nozzle is speculated to be the generating mechanism; this research is designed to prove or disprove this conjecture. Objective -experimentally investigate this phenomenon to obtain a basic understanding of the resonance mechanisms. How work contributes - the operation of STOL aircraft uses jet exhaust impinging on the flap system to generate additional lift; this is closely approximated by this research configuration. The noise increase could affect the environmental impact of future Air Force operations and the increased energy transfer from the jet to the wing flap system could affect the structural integrity of the aircraft. Understanding of this resonant phenomenon and quantitative data are needed to enable more efficient design of the blown flap system.

Experimental configufations of an axisymmetrical jet (heated and unheated) impinging on a large flat plate normal to the axis of the jet will be investigated in an anechoic chamber. Conditional sampling data of pressure fluctuations, temperature fluctuation and heat transfer rates on the plate along with the far field noise will be measured and analyzed.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NA Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

4.0003, SATELLITE TIME SERVICE DEVELOPMENT
D.W. HANSON, U.S. Dept. of Commerce, Natl. Bureau of Standards, *Boulder, Colorado* 80302 (2776119)

PURPOSE: The development of techniques and tools for transferring time and frequency information at all levels of precision and user sophistication.

OBJECTIVES: To develop the techniques and tools to use satellites for comparison of NBS time scales with laboratories worldwide and to develop a satellite broadcast system that will allow the retirement of the NBS broadcast services of WWV, WWVH, and possibly WWVB.

FY77 MILESTONES: (1) To continue SMS/GOES time code effort with emphasis on evaluation of performance, orbit determination, software, and signal recovery techniques; (2) To install an NTS system and begin collection of data to evaluate time transfer capabilities worldwide (November 1976); (3) To contribute to time code extension to Europe and Japan; and (4) to initiate NBS/NASA WWVS study.

ACCOMPLISHMENTS: Time code was broadcast continuously on both SMS/GOES satellites. A satellite-controlled digital clock for recovery and use of time was designed and patented. An improved, automated time comparison system was developed for the Wallops Island satellite facility to permit better comparison between UTC(NBS) and the satellite clock.

BIBLIOGRAPHIC REFERENCE: Cateora, J.V., Davis, D.D., Hanson, D.W., A satellite-controlled digital clock, NBS Tech. Note 681, 6/76.

SUPPORTED BY U.S. Dept. of Commerce, National Bureau of Standards

4.0004, RAPID INTERPRETATION OF AIRCRAFT SCANNER DATA USING COMPUTER INTERACTIVE SYSTEMS
EALY, U.S. Dept. of Transportation, Fed. Highway Administration, *Washington, District of Columbia* 20590 (153631 (HRB NO.))

Multispectral aircraft scanner tapes of the Tampa, Florida bypass (I-75) will be analyzed to classify the salsand geology. Results will be compared to conventional mapping methods for accuracy and cost effectiveness.

ADDENDA: Document provided to S.S.I.E. by the H.R.I.S.

SUPPORTED BY U.S. Dept. of Transportation, Federal Highway Admin.

4.0005, TOWER MEASUREMENTS OF AIRCRAFT PLUME RISE
H.M. SEGAL, U.S. Dept. of Transportation, Fed. Aviation Administration, *Washington, District of Columbia* 20590 (DF409450)

To determine the plume rise from aircraft exhaust emissions. Measured air quality levels have been below predicted concentrations in past FAA and USAF studies. One possible explanation is that the exhaust plume is rising above ground level measurement stations. This program will aid in determining if this is the case. Results will be related to the Williams AFB ambient air monitoring study 19005A12.

Two towers will be instrumented to measure carbon monoxide as a function of elevation. Plume centers and widths will be correlated with meteorological parameters. This is a feasibility study and is not expected to give comprehensive plume rise equa-

tions. The study will be at Dulles Airport since the towers, instrumentation, and FAA support are available as part of the FAA's Concorde measurement program.

ADDENDA: Supporting agency address is: AF Civil Engineering Center EVA, Tyndall AFB, FLA 32401

SUPPORTED BY U.S. Dept. of Defense, Air Force

4.0006, IMPACT OF MICROPROCESSORS ON EMC

B.J. LEON, Purdue University, Purdue Research Foundation, *Lafayette, Indiana* 47907 (DF737870; F30602-75-C-0082)

The objective of this effort is to allocate 30,000 dollars to Purdue University under the RADC post-doctoral program. This effort is to determine the impact of the increasing use of microprocessor/microcomputers on the electromagnetic compatibility of Air Force systems. Topics of concern are: assessment of the state-of-the-art of microprocessors/microcomputers vis-a-vis Air Force requirements, survey of present and future air force usage, assessment of the potential of microprocessors/microcomputers as an aid in EMC control (i.e., preprogrammed filter tuning, frequency management devices, etc.), develop recommendations for research efforts which would provide system designers with the information required to account for the EMC impact of microprocessors/microcomputers (microsystems) in Air Force systems.

The approach is (1) state-of-the-art of 'microsystems'/Air Force requirements, (2) survey of present and future Air Force usage, e.g., Air Force digital flight control system, digital avionics information system, (3) determination of EMC problems relative to 'microsystems' chip, package, leads, associated circuits under both static and dynamics conditions, (4) applicability of classical EMC fixes, i.e., shielding, filtering, etc., (5) examine potential of 'microsystems' for EMC control applications, (6) future studies to implement guidelines for system designers.

ADDENDA: Supporting agency address is: Rome Air Development Center RBC, Griffiss AFB, N Y 13440

SUPPORTED BY U.S. Dept. of Defense, Air Force

4.0007, COMBUSTION KINETICS OF SELECTED AROMATIC HYDROCARBONS

R.A. MATULA, Louisiana State Univ. Systems, School of Engineering, *Baton Rouge, Louisiana* 70803 (DF049360; AF-AFOSR-3384-77)

AF function - all aircraft functions. Deficiency - advanced air-breathing engine technology involving replacement fuels of the future requires much fundamental data on the chemical behavior of such fuels in combustors and exhausts. Objective - this research will study experimentally and analytically the mechanisms and rate constants of high-temperature thermal decomposition and oxidation of prototypical hydrocarbon components of alternate fuels. How work contributes - the results of this work will be used to optimize the performance and minimize smoke formation in jet combustors.

Quenched reaction products from a single-pulse shock tube will be analyzed by gas chromatography, mass spectrometry and chemiluminescence. In conventional chemical shock tube experiments, post-shock concentrations will be followed by optical spectroscopy, pressures by transducers, and soot production by adsorption of laser light. Data from both experiments will be combined in an analytical program to obtain mechanisms and rate constants for both quasi-global and elementary pyrolysis and oxidation reactions. Initial priority will be given to toluene, cyclohexane and decalin.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NA Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

4.0008, RESEARCH AND DEVELOPMENT OF GRAVITATIONAL RADIATION ANTENNAS

J. WEBER, Univ. of Maryland, School of Arts & Sciences, *College Park, Maryland* 20742 (PHY77-14818)

An instrumentation development program will be continued. Research will continue on the engineering design of cryogenic gravitational radiation receiver prototypes. The thermal noise associated with operating bars made from a variety of metallic and high-Q dielectric crystals will be measured as they approach thermal equilibrium at 40K. Research will examine the important question of design of a sensor to detect the motion of the antenna bar. Initial sensors will be AC- and DC-biased capacitors, but alternate approaches will be considered if greater sensitivity is needed.

This work represents a continuation of that currently supported by Foundation grant PHY75-21486.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

4.0009, TURBULENT BOUNDARY-LAYER CALCULATIONS

B. WEINBERG, U.S. Navy, Surface Weapons Center, *Silver Spring, Maryland* 20910 (DN785077)

The effort will be aimed at developing efficient, cost-effective computational techniques for the solution of the boundary layer, boundary region and Navier-Stokes equations in two and three space dimensions. Such methods are necessary to accurately predict the effects of viscous forces on aircraft and missile performance, heating rates, skin friction distributions and zones of separation. Furthermore, they can be used as design tools for Navy vehicles such as reentry and cruise missiles.

Since the governing viscous flow equations are parabolic in nature or can be cast into parabolic form, finite-difference marching techniques will be employed. However, the novelty in the proposed method will be the use of the fourth-order operator compact implicit scheme, developed at NSWC-WOL, to accomplish the spatial differencing.

ADDENDA: Supporting agency address is: Naval Air Systems Command Washington, DC 20362

SUPPORTED BY U.S. Dept. of Defense, Navy

4.0010, FAR INFRARED AND SUBMILLIMETER TECHNOLOGY 13987-P

P.E. TANNENWALD, Mass. Inst. of Technology, Lincoln Laboratory, *Cambridge, Massachusetts* 02173 (DA0E9268)

To investigate and improve submillimeter detection technology, particularly Schottky diode detectors, techniques for matching the signal radiation with the local oscillator, and to explore various sources as local oscillators. Relevance - this research is an important part of the Army's program to develop submillimeter wave technology for remote sensing that may operate under inclement weather, cloud, or countermeasure smoke environments.

Research will be conducted in the following areas: (1) improvement of current diodes, (2) detectors using all-planar fabrication, (3) modified H-guide mixer, (4) three-dimensional integrated local oscillator and detector, and (5) hybrid Impatt local oscillator-mixer configuration.

ADDENDA: Supporting agency address is: Darcom Army Research Office Box 12211 Research Triangle Park NC 27709

SUPPORTED BY U.S. Dept. of Defense, Army

4.0011, ELECTRONICS FOR ULTRAVIOLET SPECTROMETER

C.G. KUCZUN, Tri Con Associates Inc., *Cambridge, Massachusetts* (DF249990; F19628-77-C-0048)

AF function - vehicle tracking during flight and reentry, trajectory prediction, communication systems. Deficiency - present atmospheric models predict only slight variability of the density of the upper atmosphere below 200 km; however, empirical data show this conclusion to be incorrect and observations indicate density changes as great as 50 percent in both space and time at altitudes between 120 and 200 km. This altitude, important for Air Force operations, will be studied on a worldwide basis by density experiments aboard the DMSP satellites. The present work will support these experiments. Objective -in-situ measurements with rockets of atmospheric parameters to provide correlative data for comparison with photometric data from DMSP satellites. How research contributes - provides direct, low-altitude measurements of pertinent atmospheric properties as an aid in

understanding the remote optical measurements made from DMSP satellites.

Contractor shall design, fabricate and test an electronics subsystem for a double-deck solar EUV spectrometer and auxiliary experiments (a UV photometer, a dayglow photometer and an electron analyzer), modify ground support equipment consoles for the spectrometer and the photometers, and assist in the preparation of the rocket payload for flight. Measurements will subsequently be made from a rocket in the altitude range between 120 and 200 km of the photoelectron flux, differential energy distribution for energies between 0 and 100 electron volts, of the radiance of nitrogen airglow at 3371 Angstroms and of the density and composition of the upper atmosphere as established by solar ultraviolet photon absorption rates.

ADDENDA: Supporting agency address is: AF Geophysics Laboratory LKO, Hanscom AFB, Bedford, Mass 01730

SUPPORTED BY U.S. Dept. of Defense, Air Force

4.0012, UNSTEADY SHOCK WAVE MOTION IN TRANSONIC FLOW

T.C. ADAMSON, Univ. of Michigan, School of Engineering, *Ann Arbor, Michigan* 48106 (DN790024; N00019-77-C-0263)

To study the unsteady motion of shock waves in two-dimensional transonic channel flow.

Computer solutions developed during the previous contract year will be used in making a short (one to two minutes) movie film illustrating unsteady flow with a shock wave in a two-dimensional symmetric channel; the unsteady behavior will arise as a result of oscillatory pressure pulses introduced in a plenum downstream of the shock wave. Next, the study of the characteristic time for the formation and collapse of a shock-induced separation bubble will be completed. Finally, an attempt will be made to use methods developed to establish a criterion for incipient separation induced by an oblique shock wave impinging on a flat plate turbulent boundary layer in transonic and in supersonic flow; the extent to which this analysis will be carried out will depend upon the time remaining after completion of the first two tasks.

ADDENDA: Supporting agency address is: Naval Air Systems Command Washington, DC 20360

SUPPORTED BY U.S. Dept. of Defense, Navy

4.0013, SINGULARITY METHOD AND COMPLEX SINGULARITIES OF EXTERIOR SCALAR AND VECTOR SCATTERING IN ACOUSTICS AND ELECTROMAGNETIC THEORY

C.L. DOLPH, Univ. of Michigan, Graduate School, *Ann Arbor, Michigan* 48104 (DF048920; AF-AFOSR-3358-77)

AF function - radar detection and electromagnetic pulse effect determination. Deficiency - engineering techniques in resonant scattering give non-unique, possibly spurious results. Objective - more robust engineering techniques. How work contributes - by suggestive examples and general algorithms exhibiting and quantifying relevant non-intuitive effects.

Efficient characterization of resonant scattering properties of objects through a 'transfer function'-like complex function of complex frequency is common to mathematics, physics, control theory, etc. The two PI's, a mathematician and an engineer, have synthesized techniques from these fields suggesting research topics relating to the determination of such complex functions. For example poles and branch points should be characterizable in terms of properties of the scatterer using transformation of the integral equations, variational expressions, and boundary perturbation techniques. Research in these areas may explain the existing engineering solutions with spurious poles or even entirely distinct sets of poles.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NM Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

4.0014, TRANSIENT PLASMA PLUME CHARACTERISTICS IN PULSED ABLATIVE ARC

D.J. PALUMBO, Fairchild Industries Inc., *Farmingdale, New York* 11735 (DF048200; F49620-77-C-0078)

AF function - satellite surveillance, communications and navigation, advanced electric propulsion engines. Deficiency -insufficient understanding of low-temperature plasma generation and acceleration mechanisms and exhaust plume properties associated with arc jet ablative plasma thrusters and lack of realistic guidelines for predicting propulsion systems performance and plume interaction effects. Objective - to understand and develop accurate theoretical and mathematical models realistically describing the plasma generation and acceleration phenomena and plume characteristics associated with pulsed ablative arc plasma discharges (i.e., pulsed ablative thrusters). How work contributes - will provide additional understanding and realistic analytical modeling of the unsteady plasma generation and acceleration processes via ablative arcs and the accompanying exhaust plume characteristics and will contribute to establishing realistic design criteria for development of better pulsed ablative plasma thruster devices with desirable plume characteristics.

Theoretical and experimental studies of transient hypersonic plasma plumes in vacuum environment associated with pulsed ablative arc discharges will be carried out. Emphasis will be on determination of pulsed plasma thruster plume properties, including plume geometry, structure and chemical composition. A Monte Carlo simulation technique will be used to suitably describe the plume analytically. The physical model will treat the exit plane of the nozzle as a point source with all initial properties of the fluid known as a function of time. The three-dimensional unsteady plume flow will be computed using the Monte Carlo stochastic model. Verification of the model will be carried out via a concurrent experimental diagnostics program which will consist of Langmuir probe measurements to determine electron number density, electron temperature, and plasma velocity in three dimensions as a function of time.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NA Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

4.0015, TIME-DEPENDENT INSTABILITIES AND THE TRANSITION TO TURBULENCE IN SIMPLE SYSTEMS

H.L. SWINNEY, City University of New York, School of Liberal Arts & Sci., *New York, New York* 10031 (ENG76-19810)

A detailed experimental study using laser Doppler velocimetry of both the spatial and temporal correlations of the local velocity field for a simple system, Circular Couette Flow, will be carried out. A similar set of experiments on a Rayleigh-Benard system will be carried out at Haverford College (J. P. Gollub, Principal Investigator) supported by NSF Meteorology Program. The specific goals are: (1) to determine the similarities and differences between the transition to turbulence for two simple systems, and (2) to compare the observed features of the transition with (a) numerical studies by McLaughlin and Orszag of models of Couette flow and convection and (b) with general theories of the transition to turbulence proposed by Landau, Ruelle and Takens, and others.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

4.0016, CONDUCT MATH INVESTIGATIONS

N. TZOAR, City University of New York, School of Arts & Sciences, *New York, New York* 10031 (DF902380; F19628-77-C-0114)

AF function - developement of high-data-rate optical fiber communications. Deficiency - lack of knowledge regarding the detrimental effects of nonlinear pulse propagation in solid dielectric waveguides. Objective - determine possibility and conditions for propagation of intense short pulses for high-data-rate optical fiber communications. How research contributes - will determine the characteristics and thus the feasibility of ultrashort pulse propagation in optical fibers.

Investigate the broadening and narrowing of short pulses in nonlinear circular optical waveguides by solving electromagnetic wave equations analytically and numerically.

ADDENDA: Supporting agency address is: Rome Air Development Center ETS, Griffiss AFB, N Y 13440

SUPPORTED BY U.S. Dept. of Defense, Air Force

4.0017, EXPERIMENTAL RESEARCH OPERATIONS
K.H. BALL, Systems Research Labs. Inc., *Dayton, Ohio* 45432 (DF140790; F33615-76-C-3162)

Experimental test facilities are required for the support of research efforts in fluid mechanics, propulsion and the aerodynamics of military aircraft and missiles. Fundamental concepts relating to weaponry utilize test facility data for validation, and input is required for checks on analytical and computational methods in fluid dynamics. It is the objective of this work unit to provide operational support of the research facilities and develop improved instrumentation and testing techniques.

Conduct experimental aerodynamic and fluid dynamic research studies in support of other in-house work units under task 2307O4 using facilities that span the range from Mach 3 to 14 with primary emphasis on tests in the Mach 6 high Reynolds number facility. Support will also be provided to AFAPL-efforts in facilities that share equipment and utilities with the AFFDL-owned wind tunnels such as the combustion test facility and the compressor test facility.

ADDENDA: Supporting agency address is: AF Flight Dynamics Laboratory FXG, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense, Air Force

4.0018, ADVANCED CONCEPTS IN CLOSED-CYCLE ELECTRICAL DISCHARGE LASER TECHNOLOGY
R.A. OLSON, Systems Research Labs. Inc., *Dayton, Ohio* 45432 (DF460890; F33615-76-C-2177)

AF function - electrical discharge gas lasers. Deficiency - presently there are no coherent long-life light sources to simultaneously cover all transmission windows from 1 to 5 microns. Research - an existing research system will be improved in aerodynamics, power conditioning and excitation, including photoionization to meet AF requirements. A significant decrease in size and weight will be achieved by development of a compact configuration. The closed-cycle laser technology developed will be applied to other electrical discharge lasers of AF interest. How research contributes - this research supports several AF requirements for multiple-wavelength medium-power high repetition rate sources in the visible to infrared spectral range for electrooptical countermeasures.

The state-of-the-art of closed-cycle laser technology will be improved further by developing and incorporating new aerodynamic configuration concepts, by improvements in the laser geometry, by further development of the fast pulse-high repetition rate power conditioning system and by improving the laser parameter range (wavelength, power, rep-rate) for example with improved photo-preionization. A new coaxial-flow system will be developed and tested. The closed cycle-high purity technology will be applied to other selected electrical discharge lasers of AF interest.

ADDENDA: Supporting agency address is: AF Aero-propulsion Laboratory POD, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense, Air Force

4.0019, LABORATORY INVESTIGATION OF RECTIFIED ALTERNATOR MODEL USED IN WEIGHT MINIMIZATION STUDY
T.A. STUART, Univ. of Toledo, Graduate School, *Toledo, Ohio* 43606 (DF049780; AF-AFOSR-3413-77)

AF function - increased electronic mission requirements have led to the need for new airborne dc power system capable of delivering tens of megawatts at thousands of volts. Opportunity - one of the systems proposed to meet these requirements uses a phase controlled voltage regulator with an lc output filter in conjunction with a superconducting alternator. Since weight is a critical problem at these power levels one of the important subjects of concern is the weight of the output filter, which may weigh, even with most advanced components, several hundred pounds. Objective - it is therefore highly desirable to find a systematic design approach that will minimize the filter weight for a given set of operating conditions. Specifically this effort is to determine how the source impedance can be used to ease the requirements on the output filter. Previous analysis of the filter will be extended to include the relationship to the ac source impedance (i.e., output impedance of the alternator) since it appears that proper selection of the impedance will enable to reduce the weight of the filter and alternator, e.g., a larger value of the source impedance will tend to lower the maximum output ripple at full load and will allow the use of a small field inductance in the alternator, as well as tend to limit fault or surge currents which are critical problems with the type of loads to be used in high-power supplies. How work contributes - the research provides basic criteria that will allow to minimize the weight of the filter and later of the alternator, thus rendering information which will be useful in the design of the system.

The analytical methods for determining the value of the source impedance, which will minimize output ripple and thus filter weight, as well as the computer program for calculating the minimum filter weight for a given source impedance will be experimentally tested, in conjunction with machinery available at the University, industry and AFAPL.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NE Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

4.0020, LASER VELOCIMETER MEASUREMENTS OF THE FLOW OVER MISSILES AT HIGH ANGLES OF ATTACK 14761-E
K.E. HARWELL, Univ. of Tennessee, Graduate School, *Knoxville, Tennessee* 37916 (DA0F9002; DAAG29 77 G0138)

To utilize a three-dimensional laser Doppler velocimeter (LDV) to measure the velocity distribution and vortex structure in flows over missiles at high angles of attack. Relevance - a quantitative understanding of the flow field structure about missiles at high angles of attack is directly relevant to the development of highly reliable, accurate, and maneuverable missiles.

Simultaneous three-dimensional velocity measurements at a point in a flow established about bodies of revolution at high angles of attack in both subsonic and supersonic wind tunnels will be made using both a dual-scatter LDV and a reference beam LDV system. Measurements will be made both in the boundary layer and vortex wake regions.

ADDENDA: Supporting agency address is: DARCOM Army Research Office Box 12211 Research Triangle Park NC 27709

SUPPORTED BY U.S. Dept. of Defense, Army

4.0021, ANALYSIS OF THE ROCKET EXHAUST FLOW-FIELD IN A NON-TIPOFF LAUNCH TUBE
J.J. BERTIN, Univ. of Texas, School of Engineering, *Austin, Texas* 78712 (DA0L4991)

To determine the effects and causes of blow-by missile exhaust gas flow (both massive and secondary) on a missile trajectory when fired from various launch tube designs. A description of the exhaust gas flow field between the missile body and launch tube will be formulated.

Utilizing the University of Texas rocket exhaust effects facility (colg gas) a rocket-launcher configuration for which there would be negligible blow-by flow will be investigated. A numerical code which describes the resultant flow-field in the absence of massive blow-by will be developed.

ADDENDA: Supporting agency address is: MIRADCOM GE&MS Directorate, Technology Lab, Redstone Arsenal AL 35809

SUPPORTED BY U.S. Dept. of Defense, Army

4.0022, RESTORING IMAGES DEGRADED BY ATMOSPHERIC TURBULENCE
C.K. RUSHFORTH, Utah Higher Education System, Graduate School, *Salt Lake City, Utah* 84112 (DF047250; AF-AFOSR-3212-77)

AF function - surveillance and detection of missiles and satellites. Deficiency - degradation of images produced by atmospheric turbulence. Objective - to produce a practical procedure for achieving increased resolution in the presence of atmospheric turbulence. Contribution - increase of resolution in images degraded by atmospheric turbulence.

Theoretical studies and one-dimensional simulations are to be conducted using the two restoration procedures of Knox and

Thompson and of Sherman. Existing models of atmospheric turbulence and sensor noise will be incorporated. These procedures will be applied to data obtained from analog simulation of the atmosphere and real astronomical data.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NP Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

4.0023, AERODYNAMIC FORCES EXERTED ON AN ARTICULATED HUMAN BODY SUBJECTED TO WINDBLAST
D.J. SCHNECK, Virginia Poly. Inst. & St. U., School of Engineering, *Blacksburg, Virginia* 24061 (DF048300; AF-AFOSR-3296-77)

AF function - the Air Force operational environment involves exposure to a wide variety of mechanical forces including flail and impact. These forces are of special significance in relation to the incidence of ejection from high-performance aircraft where the probability of disabling injury is unacceptably high. Deficiency - this research will provide input data needed for an elaborate bimechanical computer model of the human body which has been developed to determine the stresses, strains and injury mechanisms due to windblast during ejection. Objective - development of the theory of windblast as initiated under USAF/ASEE summer faculty research program, examine the contribution of flow separation to limb flail during ejection, provide data for wind tunnel tests and for the articulated total body model studies at AMRL. How research contributes - this research will contribute directly to subareas 1.6, 'crew safety and effectiveness in mechanical force environments.'

The research will elucidate the contribution of flow separation to the factors which initiate limb-dislodgment forces during ejection. These data will provide input to the AMRL articulated total body model, which will analytically describe the dynamics of ejection.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NL Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

4.0024, REMOTE SENSING RESEARCH IN SUPPORT OF AIR CUSHION VEHICLE EMPLOYMENT
J.P. HENLEY, U.S. Army, Remote Sensing Center, *Fort Belvoir, Virginia* 22060 (DA0N8007)

To evaluate remote sensing imagery as a means for rapidly and economically obtaining terrain information pertinent to ACV operations, and b) to acquire knowledge about probable ACV movement capabilities in Europe which will assist in developing ACV employment doctrine for the area.

Contacts will be made with TRADOC and other agencies to determine operational characteristics and limiting terrain factors associated with the planned employment of ACV's. Once critical terrain elements have been identified, research will concentrate on deriving movement capability overlays (slope classes, vegetation, land use, shoaling, obstacles, etc.) from all available imagery forms of representative test areas of Europe. In addition to providing direct support to ACV operations, these overlays and maneuver capability patterns would permit TRADOC to develop realistic tactical employment doctrine for ACV's in conjunction with the vehicle development program. Maneuvering limitations identified within the terrain units (via remote sensor imagery) could also serve as a basis for realistic and practical design modification early in the development cycle. Methodology will be prepared in two forms: 1) a descriptive, easily understood pamphlet with accompanying overlays and, 2) a more detailed technical report outlining preparation procedures, skill levels and planning details to enable military units within the operational area, such as terrain detachments, to produce similar studies on a routine basis.

ADDENDA: Supporting agency address is: OCE ETL Center for Remote Sensing, RI, Ft Belvoir VA 22060

SUPPORTED BY U.S. Dept. of Defense, Army

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production and Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, OPERATION OF IMS ALASKA MERIDIAN ARRAY OF MAGNETOMETERS, RIOMETERS AND ALL-SKY CAMERAS
G.J. ROMICK, Univ. of Alaska, Geophysical Institute, *Fairbanks, Alaska* 99701 (ATM76-12260 A01)

As part of the United States' effort during the International Magnetospheric Study (IMS), the Geophysical Institute of the University of Alaska, in response to the guidelines set by the National Academy of Sciences, will install, maintain and operate magnetometers in a chain of observatories extending north to south from Eureka, North West Territories, Canada, to Talkeetna, Alaska. In addition to the magnetometers, other instruments (all-sky cameras and riometers) which have also been recommended for use during the IMS will be installed, maintained and operated as necessary at the stations of the north-south meridian chain as well as at stations to the east and west of this chain.

Installation of the new magnetometers (with satellite data transmission systems supplied by the United States Geological Survey for the IMS) will be coordinated with the installation of the riometers supplied by the University of California, San Diego, and the new all-sky cameras supplied by the Geophysical Institute of the University of Alaska, which have also been developed for the IMS.

Site selection, maintenance and operation, training, installation, initial data reliability checks, and station logistic supply for the first 2 years of the IMS are included in this award.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0002, EARTHQUAKE HAZARDS GEOLOGIC MAPPING OF THE SAN ANDREAS FAULT ZONE, LOS ANGELES COUNTY, CALIFORNIA
C.H. GRAY, State Div. of Mines & Geology, *Los Angeles, California* 90012 (14-08-0001-G-344)

STATE TO WHICH PROJECT PERTAINS: California.

Individual fault traces within the San Andreas fault zone in the Quail Lake, Lake Hughes, and Valyermo segments are being delineated on orthophoto bases at scale of 1:12,000 following intensive field examinations and aerial photointerpretations of geologic, geomorphic and vegetative features indicative of surface faulting. Evidence for recency of displacement of surficial materials in stream channels, distinctive slope-wash and colluvial material, and other Quaternary deposits are being examined to assess potential hazard of the faults.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0003, A STUDY OF REGIONS OF DETACHED PLASMA IN THE OUTER MAGNETOSPHERE
M.G. KIVELSON, Univ. of California, Inst. of Geophys. & Pla. Phys., *Los Angeles, California* 90024 (ATM74-23464 A01)

This grant will support an investigation into a number of important magnetospheric processes including: the coupling of the solar wind-magnetosphere-ionosphere system through the resonant properties of the magnetospheric cavity; the interaction and exchange of energy between waves and particles in the magnetosphere and the role of resonant particles in the interaction; and the injection and redistribution of plasma within the magnetosphere produced by large-scale (convection) electric fields.

The diverse objectives are unified by the fact that the primary data base for the analysis is formed by measurements obtained from a number of Ogo-5 spacecraft instruments, of which the most important for the present work are the Lockheed Light Ion Mass Spectrometer and the UCLA Fluxgate Magnetometer. All relevant data are available or can be readily obtained on request. Initial phases of the investigation have shown that the data is capable of providing unique in-situ measurements of properties of ULF waves in the magnetosphere while simultaneously giving indications of probable generation and amplification processes.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0004, RADIOCARBON DATING AND ENVIRONMENTAL RESEARCH

W.F. LIBBY, Univ. of California, School of Letters & Science, *Los Angeles, California* 90024 (EAR76-14273)

The project concerns application of the radiocarbon method to three separate and distinct problems: (1) a determination of the residence time of carbon dioxide in the stratosphere, (2) a determination of the rate of climatic change at the end of the Pleistocene Epoch, and (3) detection of prehistoric movements of the San Andreas Fault.

Carbon dioxide will be sampled from the lower stratosphere on a monthly basis with sampling devices designed to be used on NASA's high-altitude research vehicle (U-2). The radiocarbon content of the carbon dioxide thus collected will be determined and used to calculate mixing rates of carbon dioxide between the stratosphere and the troposphere.

The method of determining rate of climatic change will be determined by examination of the botanical content and radiocarbon dating of Neotoma middens. The plant species present in the middens will be used as a measure of the local climate and the radiocarbon age will date it. Accumulation of data from middens of varying age will thus yield the rate of climatic change.

The third part of the research will concern the dating of movement along major faults by radiocarbon dating of plant materials buried by landslide activity associated with the movement. Fault displacement and the resulting earthquake frequently generate large landslides that bury trees and other plants, thus preserving a record of the time of faulting.

The three projects described above present important applications of the radiocarbon dating technique.

SUPPORTED BY U.S. National Science Foundation, Div. of Earth Sciences

5.0005, MAGNETIC OBSERVATORIES FOR THE INTERNATIONAL MAGNETOSPHERIC STUDY

R.L. MCPHERRON, Univ. of California, School of Letters & Science, *Los Angeles, California* 90024 (ATM76-17035)

During the International Magnetospheric Study (IMS) the University of California at Los Angeles (UCLA) will install four magnetic observatories at remote locations in the Pacific and Atlantic Oceans. The observatories will be entirely automatic, communicating with the U.S. through synchronous meteorological satellites. The observatories will include a magnetometer, data formatter and a data collection platform radio set. These observatories will fill gaps in the existing chain of mid-latitude observatories spanning North America. The entire chain will provide correlative data to be used throughout the world in studies of ultra-low-frequency waves, magnetospheric substorms and magnetic storms. At UCLA the data will be used to supplement magnetic field observations which will be made during the IMS by UCLA experiments on the spacecraft ATS-6 (Applications Technology Satellite) and ISEE A/B (Mother/Daughter) (International Sun Earth Explorer). The ground measurements are important in the interpretation of both satellite and ground data, helping to define the time and location within the magnetosphere of substorms and storms. Magnetospheric substorms have recently been recognized as the cause of auroral disturbances in polar regions. These disturbances are important because they are known to be the cause of failures in synchronous communication satellites, electrical distribution systems, and telephone networks. They also cause disruptions of polar radio communications, spurious radar returns, and are a serious problem in mineral exploration and navigation.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0006, IR MICROWAVE CLOUD STUDY

P.A. DAVIS, Stanford Research Institute, *Menlo Park, California* 94025 (DF247820; F19628-76-C-0275)

AF function - all-weather operation of tactical and strategic forces. Deficiency or opportunity - limited ability to estimate cloud conditions as a function of altitude from satellites. How development contributes - establishes how well a combination of infrared and microwave channels can improve estimates of cloud conditions based on single channels.

The spectral regions near 4 and 12 micrometers in the infrared, and 60 and 118 gHz in the microwave differ in their sensitivity to clouds. If spectral filters can be specified for each of these regions such that weighting functions for the clear atmosphere are nearly identical, then a set of equal temperatures would indicate a clear atmosphere, while unequal temperatures can be used to estimate cloud phase and altitude. Suitable spectral channels will be identified by extensive calculations of atmospheric transmittance for a great variety of potential channels.

ADDENDA: Supporting agency address is: AF Geophysics Laboratory LY L G Hanscom AFB, Bedford, Mass 01730

SUPPORTED BY U.S. Dept. of Defense, Air Force

5.0007, MERIDIAN PHOTOMETER CHAIN

S.B. MENDE, Lockheed Aircraft Corporation, *Palo Alto, California* 94304 (ATM76-00926 A01)

This grant funds the fielding and operation of a three-station chain of meridian scanning photometers, developed under National Science Foundation grant ATM-7600926. These photometers are being fielded as a part of the International Magnetospheric Study (IMS). The photometer chain will provide a complete latitude coverage of the auroral oval from 60 degrees invariant latitude to about 75 degrees. The data will be presented in the form of computer-generated grey scale presentations (KEOGRAMS) covering the entire auroral oval. The scientific objectives of the program include the investigation of subvisual pre-substorm signatures in spectral and spatial characteristics of the aurora, the details of spectral changes during poleward expansion and recovery, the role of protons in the substorm process, the nature of the diffuse aurora, the integrated conductivity of the auroral region during substorm process. In coordination with satellites such as ISIS-II, TRIAD, ISEE there is planned an investigation of field aligned currents, the nature of near-Earth acceleration mechanisms, and their relationship to latitude time morphology of precipitation.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0008, STUDIES IN REMOTE SENSING APPLIED TO GEOCHEMICAL EXPLORATION

F.C. CANNEY, U.S. Dept. of The Interior, Geological Survey, *Denver, Colorado* 80225 (9330-00815)

STATES TO WHICH PROJECT PERTAINS: Topical project - Some work done in Maine, Montana, and Colorado.

The overall objective of this project is to develop remote-sensing techniques for identifying mineralized areas in regions of heavy vegetation. Vegetation can be used as a link between abnormal chemical conditions in the soil and an aircraft- or spacecraft-mounted sensor for the following reasons: (a) plants generally reflect their geological environment by their distribution patterns and minor-element content; and (b) laboratory and field studies have established that metal stressed and normal vegetation can have subtly different spectral characteristics. Therefore, a geochemical anomaly in a heavily forested area might be detected by spatial and/or spectral changes in the reflection of the vegetation canopy.

To date aerial surveys using color infrared film, multiband photography, and multispectral line scanners, coupled with the simpler interpretative techniques, have not been successful in discriminating geochemical anomalies in heavily forested areas. Apparently the reflectance anomaly was totally obscured by variables unrelated to soil geochemistry. During the current year emphasis will be given to computer manipulation of both digitized photographic and LANDSAT data. The techniques that appear most promising are classification, textural analysis and rationing.

Some research will also be done in cooperation with Goddard Institute of Space Studies using its experimental 500-channel airborne spectroradiometer.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0009, MAGNETIC STATIONS OF THE IMS - NSF
F.C. FRISCHKNECHT, U.S. Dept. of The Interior, Geological Survey, *Denver, Colorado* 80225 (9780-70001)

STATES TO WHICH PROJECT PERTAINS: Colorado.

The International Magnetospheric Study (IMS) is to be a three-year program funded by the National Science Foundation with the principal objective of achieving a comprehensive, quantitative understanding of the dynamical processes operating in the earth's plasma and field environment. Under guidelines developed by a study panel of the National Academy of Sciences, networks of ground-based magnetometer stations will be established across the North American Continents. It is the Survey's responsibility to develop, test and calibrate the automated instrumentation systems planned for the program. A major innovation with these systems will be the utilization of a SMS/GOES satellite telemetry relay link providing 'real time' data from unmanned stations.

All of the operating systems will be shipped this year and technical support will be provided for field operations.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0010, DATA INTERPRETATION ON MEASUREMENT OF TRACE GASES
H.L. MAI, Univ. of Denver, Graduate School, *Denver, Colorado* 80210 (FA77WA-3949; FA59958 (TRAIS NO.))

The objective is to conduct a study and analysis to determine the error in deducing nitric oxide (NO) and nitrogen dioxide (NO2) altitude profiles as derived from infrared solar spectra obtained at high-altitude (25 to 35 km) balloon altitudes during sunset and/or sunrise and to prepare a report which explains the results obtained and discuss the importance of these findings in the context of a stratospheric ozone reduction estimation.

SUPPORTED BY U.S. Dept. of Transportation, Office of the Secretary

5.0011, TRANSFER OF SOLAR RADIATION IN CUMULUS CLOUDS WITH APPLICATION TO THE GATE
T.B. MCKEE, Colorado State University, School of Engineering, *Fort Collins, Colorado* 80521 (ATM76-80568)

The objective of this research is to study the interaction of solar radiation with clouds of similar vertical and horizontal dimensions. Observations of scattered solar radiation emanating from clouds during the Global Atmospheric Research Program's (GARP) Atlantic Tropical Experiment (GATE) will be compared with calculations from a computer model to verify model application in the atmosphere. Some additional radiation observations will be made during the summer of 1977 from the National Center for Atmospheric Research's (NCAR) Queen Air. These will serve to fill in some gaps that exist in the GATE data set.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0012, A COMPARATIVE STUDY OF MARINE INVERSIONS OVER COASTAL UPWELLING REGIONS
D.W. STUART, State University of Fla. Sys., School of Arts & Sciences, *Tallahassee, Florida* 32306 (ATM77-02520)

The structure and distribution of marine inversions in the lowest 5,000 ft. of the atmosphere over upwelling regions will be studied. The basic data are (430) aircraft soundings taken in connection with localized studies of coastal upwelling off Oregon (1972, 1973), Northwest Africa (1974), and Peru (1976, 1977).

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0013, STUDIES OF IONOSPHERIC DYNAMICS BY INCOHERENT SCATTER
S.A. BOWHILL, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801 (ATM77-06787)

This grant funds an experimental and data-analysis study of ionospheric dynamics using the incoherent scatter radars at Jicamarca, Peru, and at the National Astronomy and Ionosphere Center at Arecibo, Puerto Rico. This extends work previously supported under ATM-7515523. Specific work to be done includes the analysis of stratospheric and mesospheric dynamics data already taken at Jicamarca, a new measurement campaign at Jicamarca, and a set of measurements at Arecibo for the study of sporadic E and ion conduction.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0014, SYSTEMS EVALUATION - TO JUDGE QUALITY OF NMC'S ANALYSES & FORECASTS BOTH WITH PRESENT OPERATIONAL SYSTEMS & WITH PROPOSED NEW SYSTEMS
UNKNOWN, U.S. Dept. of Commerce, Development Division, *Camp Springs, Maryland* 20233

DATA SYSTEMS TEST (DST): Objective: To assure successful planning and testing of proposed operational concepts; data management and utilization, and evaluation of conventional meteorological observations including meteorological satellites and analysis-prediction systems for the First GARP Global Experiment. The DST has been a continuing project since 1972 under NASA Contract S-70252-AG.

EVALUATION AND MONITORING: Operational Monitoring: Objective: Identify characteristic deficiencies both of a regular nature and an exceptional nature by routinely monitoring NMC's major NWP products; and to seek out causes and introduce remedies.

SELECTIVE CASE ARCHIVE: Objective: To construct an archive of carefully selective cases of particular meteorological interest for testing new or improved analysis-forecast systems.

EVALUATION METHOD DEVELOPMENT: Objective: To develop improved methods of evaluating meteorological products.

STRATOSPHERIC DATA EVALUATION: Objective: To determine the compatibility of various types of stratospheric data (radiosonde, rocketsonde, and satellite) in order that the information can be logically used together in various operational analysis systems.

OZONE ANALYSIS AND MONITORING: Objective: To analyze the total ozone and ozone mixing ratio at 30, 10, 5, 2, and 0.4 mb using data from the Backscatter Ultraviolet Ozone sensor (BUV) for period 1970-1976, in order to provide background information on natural ozone variability for United States Stratospheric Monitoring Program.

STATUS: An objective analysis system (modified Cressman technique) has been developed for the ozone data, and a series of Northern Hemisphere (and some Southern Hemisphere) charts has been produced.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Weather Service

5.0015, USE OF SATELLITE VHRR DATA FOR SEA ICE MAPPING
L.A. LESCHACK, Development & Reso. Trans. Co., *Silver Spring, Maryland* 20902 (7-234; 7-35173)

OBJECTIVE: To further development of an automated system for mapping the extent, thickness, and movement of sea ice in the Arctic.

APPROACH: Building on previous work, procedures will be defined for translating VHRR radiant temperature parameters into a categorization of surface conditions (i.e., first-year ice, undeformed multi-year ice, ridged multi-year ice, land-fast ice, open water, land and clouds).

CURRENT PLANS: Use VHRR imagery and statistical analyses of small arrays of digital VHRR data over the AIDJEX (Arctic Ice Dynamics Joint Experiment) area in April of 1975 and 1976 to attempt a delineation of ice types by objective analysis techniques such as cluster analysis.

PROGRESS: From previous research a useful empirical relationship was found: airborne or satellite radiant temperature measurements are proportional to the thickness of the ice, are normally distributed, and the areas under the histograms are proportional to the surface areas of the pack ice types from which they are derived.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Environmental Satellite Service

5.0016, AFOS DEVELOPMENT - SYSTEMS DESIGN
R.C. LEE, U.S. Dept. of Commerce, Integrated Systems Laboratory, *Silver Spring, Maryland* 20910 (8C27401)

TECHNICAL OBJECTIVE: To develop an efficient and effective functional design for the AFOS system.

APPROACH: AFOS Systems Design Task develops functional designs for the overall AFOS system and its appropriate subsystems. User requirements are identified and analyzed; designs are formulated, analyzed, coordinated, and refined; plans are coordinated with other agencies. Travel to field offices is included to complete detailed design studies.

PROGRESS (July 1975 to October 1976): The design of the National Distribution Circuit (NDC) and the State Distribution Circuits was completed. The design for a System Monitoring and Control Center (SMCC) was completed. Designs for AFOS interfaces to the National Hurricane Center, the National Severe Storms Forecast Center and the National Meteorological Center were completed also. A major effort began on the design of data acquisition interfaces (upper air, radar and automatic surface observations) to AFOS. Significant progress was made in investigating options for providing continued and improved service to non-government users as well as FAA and the Air Weather Service. The data compression analysis was completed.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Weather Service

5.0017, AIRBORNE EQUATORIAL SCINTILLATION STUDIES
J. BUCHAU, U.S. Air Force, Geophysics Laboratory, *Bedford, Massachusetts* 01730 (DF249070)

AF function - communication through disturbed ionospheres and AFSATCOM. Deficiency - prediction and real time specification of the ionosphere. Objective - to determine the effects of equatorial f-layer irregularities on satellite-to-aircraft vhf propagation. How research contributes - payoff is in terms of improved design and operation of hf and vhf communication systems. Improvements are in terms of bandwidth, power requirements, frequency management, system accuracy and reliability assessment, and operational procedures.

The Airborne Ionospheric Laboratory, which is equipped to receive vhf transmissions from satellites and instrumented for ionospheric studies, will conduct flights in equatorial regions, in conjunction with extensive ground-based experiments. Flight paths will be chosen to optimize investigation of the equatorial irregularities to include their formation, their latitudinal structure, and their effects on the satellite signals. The aircraft data will be correlated with the ground-based observations to permit extrapolation of the more limited airborne data base to cover the periods of interest. Satellites to be used in these studies are the LES 8/9, MARISAT and the ATS series.

ADDENDA: Supporting agency address is: AF Geophysics Laboratory PH Hanscom AFB, Bedford, Mass 01730

SUPPORTED BY U.S. Dept. of Defense, Air Force

5.0018, IMAGERY INFORMATION EXTRACTION
J.J. BUNTING, U.S. Air Force, Geophysics Laboratory, *Bedford, Massachusetts* 01730 (DF249520)

AF function - weather observing, analysis and forecasting military operations. Deficiency - lack of adequate information to meet military weather support requirements. Objective - development of improved techniques to facilitate real time processing of satellite imagery. How development contributes - makes possible the real-time use of high-resolution satellite imagery in operational analysis and forecasting.

Develop a prototype cloud analyzing system based only on satellite data. Test this system and compare it with the results of the current operational system. Evaluate the results and if indicated work to expand and refine the system. This is a continuation of the work formerly performed under IHWU 66980205 which was terminated for administrative reasons.

ADDENDA: Supporting agency address is: AF Geophysics Laboratory LY Hanscom AFB, Bedford, Mass 01730

SUPPORTED BY U.S. Dept. of Defense, Air Force

5.0019, IMPROVED ROCKETBORNE PZL DENSITOMETER PAYLOADS
D.H. FRYKLUND, Accumetrics Corporation, *Cambridge, Massachusetts* (DF249630; F19628-77-C-0163)

AF function - airborne surveillance and weapons delivery. Deficiency - improved accuracy required for low-altitude satellite ephemerides and impact prediction for operations AF RV's and weapons systems. Research - rocketborne instrumentation and improved telemetry for accurate density measurements in 50-150 km altitude range. How research contributes - density data in this altitude range can contribute significantly to improved impact prediction capability for ICBMs, RVs, increased computational accuracy for satellite ephemerides and improved mode atmospheres that result from an increase in the density data base.

Work to be performed on this contract will consist of the development, fabrication and testing of operational rocketborne falling sphere instrumentation that will enable atmospheric density to be determined with improved accuracy in the altitude region between 50 and 150 km. In addition the work will include system analysis based upon previous flight results. This will provide an opportunity for in-depth evaluation of flight performance in order to attain improved reliability and survivability. Rocketborne density payloads using hardware developed under this contract will be launched at selected sites in accordance with AF programs and requirements.

ADDENDA: Supporting agency address is: AF Geophysics Laboratory LK Hanscom AFB, Bedford, Mass 01730

SUPPORTED BY U.S. Dept. of Defense, Air Force

5.0020, CHEMICALLY PERTURBED STRATOSPHERE
N. SZE, Environmental Res. & Tec. Inc., *Concord, Massachusetts* 01742 (DF248850; F19628-77-C-0078)

AF function - environmental effects of Air Force systems operations in the stratosphere. Objective - to determine the effects of perturbations in the natural stratosphere-troposphere caused by the exhaust emissions from Air Force vehicle operations. How research contributes - provide the Air Force with information on the degree of environmental modifications by its systems operations which will prevent, by arbitrary decision, restrictions and delays on its missions.

Develop a new model which will couple radiative transport to chemistry and dynamics to provide a more complete description of environmental effects of injected pollutants.

ADDENDA: Supporting agency address is: AF Geophysics Laboratory LKD, Hanscom AFB, Bedford, Mass 01730

SUPPORTED BY U.S. Dept. of Defense, Air Force

5.0021, THE PHYSICAL AND BIOLOGICAL OCEANOGRAPHY OF PLANKTON PATCHINESS AND INTERNAL WAVE INTERMITTENCY IN MASSACHUSETTS BAY
L.R. HAURY, Woods Hole Oceanographic Inst., *Woods Hole, Massachusetts* 02543 (OCE77-08682)

Discrete internal wave packets are generated on a semi-diurnal basis in Massachussets Bay. This project will investigate the properties of these waves and the interaction of internal waves with the phytoplankton and zooplankton of the bay. The internal wave fields will be monitored by means of thermistor chains, fine structure XBT surveys, and aerial photography. Simultaneous chlorophyll concentration, zooplankton abundance, and physical microstructure observations will be measured using a towed vehicle carrying an in situ fluorometer, Longhurst Hardy Plankton Recorder, and CTD microprofiler. The physical and biological data will also be used to attempt to apportion the back-scattered acoustic energy from high-frequency, narrow-beam echo sounders between that from organisms and that from thermal microstructure. These results will give a quasi-synoptic acoustic picture of the vertical and horizontal physical and biological structure of the water column throughout the experiment.

SUPPORTED BY U.S. National Science Foundation, Div. of Ocean Sciences

5.0022, IMPROVEMENT OF REMOTE SENSING TECHNOLOGY RESEARCH APPLIED TO LAND RESOURCE ANALYSIS

D.J. BARR, Univ. of Missouri, School of Mines & Metallurgy, *Rolla, Missouri* 65401 (SER77-06848)

The proposed project will provide the instrumentation, graduate student support, and research climate for improving the application of remote sensing technology to the solution of land resource allocation problems. Research into methods of detecting, delineating, and/or monitoring of land use, mineral and energy resource, agricultural, forest and range resources, water resources, reclamation, and environmental quality will be improved and enhanced. Satellite and aircraft image processing equipment will be procured and integrated into the existing remote sensing laboratory. Graduate research opportunities will be provided along with seminars for exchange of research ideas, problems, and results among researchers from a variety of science and engineering disciplines.

SUPPORTED BY U.S. National Science Foundation, Div. of Science Education Resources Improvement

5.0023, PRECISION IMAGERY SATELLITE PHOTO RECORDER

L.F. BOSART, State University of New York, School of Arts & Sciences, *Albany, New York* 12222 (ATM76-82454)

The purpose of this equipment proposal is to obtain support for the acquisition of a precision imagery satellite photo recorder. Such a recorder will make available high-quality satellite pictures (visible, IR-day and night) suitable for delineating research ideas on a real-time basis. An existing false color digital densitometer at State University of New York at Albany will facilitate the analysis of the imagery.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0024, DYE LASER LIDAR SYSTEM FOR REMOTE MONITORING OF AIR POLLUTION PRODUCED BY STATIONARY SOURCES, AREA SOURCES, AND PRESENT IN AMBIENT CONDITIONS

S.A. AHMED, City University of New York, School of Engineering, *New York, New York* 10031 (R803109-037; G712B-BA-37)

A development program is proposed to define the working parameters for a practical lidar system for remote monitoring and tracking of specific air pollutants. The system is designed to be of particular use in the monitoring and tracking of molecular pollutants produced by stationary and area sorces as well as for measuring ambient pollution conditions.

A multifrequency dye laser will be used to detect pollutants by measuring the differential absorption of atmospheric elastic backscatter on and off resonance absorption peaks. The proposed scheme therefore combines the sensitivity of resonance absorption measurements with range information to provide an accurate method of determining accurately pollutant concentration and its spatial distribution.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Sciences Research Lab.

5.0025, GRAVITY AND ACOUSTIC WAVES IN THE ATMOSPHERE

W.L. DONN, Columbia University, Lamont Doherty Geolog. Observ., *Palisades, New York* 10964 (ATM74-09449 A03)

For nearly twenty years the research group at the Lamont-Doherty Geological Observatory has carried out extensive experimental and theoretical work in the area of waves in the atmosphere. The group has built up a large experimental facility and has accumulated much high-quality instrumentation for the observation of these waves. The results of measurements and theoretical work have appeared regularly in the scientific journals. The group's present research activities include the three areas of internal gravity waves, low-frequency infrasound and infrasound from meteors. In recent years it has come to be realized that gravity waves play important roles in a wide range of atmospheric phenomena. Gravity waves may act as triggers for larger scale events. They often propagate out from larger scale features and hence serve as indicators of such features. In this research program extensive studies concerning the origin, propagation and spectral characteristics of internal gravity waves will be carried out. One of the greatest strengths of the laboratory lies in the huge accumulation over about 15 years of continuous high-quality multipartite gravity wave records. A statistical study of these records will be performed to establish association with synoptic patterns. Infrasound of about 0.2Hz in frequency is generated by ocean waves. This sound propagates upwards into the upper atmosphere when it is reflected one or more times and returned to the surface. The group has detected this sound and will continue to refine and develop the infrasound technique as a continuous monitor of the upper atmosphere. Meteors which penetrate to the lower atmosphere also generate infrasound. These signals have been detected, and in a cooperative program with the University of New Hampshire a tripartite acoustic array has been located at the site of a meteor-radar wind detection system to further study and identify these signals.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0026, OBSERVATION OF VHF BEACONS OR SATELLITES

K. PAI, U.S. Army, Res. Office, *Durham, North Carolina* 27706 (DF580020; AF-AFOSR-0215-74)

AF function - navigation. Deficiency - signal fading, pulse delays, refraction errors. Objective - measures ionospheric parameters related to geomagnetic activity. How research contributes - results used to develop global predictive models of scintillation and total electron content. Models support AFSATCOM and GPS development. Work is done in conjunction with the Joint Satellite Studies group.

Signals from transmitting satellites will be monitored to determine morphology and statistics of ionospheric total electron content and scintillation.

ADDENDA: Supporting agency address is: AF Geophysics Laboratory PHP, Hanscom AFB, Bedford, Mass 01730

SUPPORTED BY U.S. Dept. of Defense, Air Force

5.0027, OBJECTIVE SCALE-DEPENDENT ANALYSES OF ELECTRA AIRCRAFT DATA FROM PROJECT DUSTORM AND GAMETAG

E.F. DANIELSEN, Oregon State Higher Educ. Sys., School of Science, *Corvallis, Oregon* 97331 (ATM77-15240)

The Electra aircraft, equipped with fast responding meteorological, trace gas and aerosol sensors, made flights through three separate folded tropopause structures during the operation of Project DUSTORM, 1975. Equipped with additional sensors, the Electra will make mid-boundary layer and mid-tropospheric measurements from above the Arctic Circle to 30 degrees south of the Equator in 1977 as part of the chemical sampling program GAMETAG. These simultaneous measurements will provide new observations on the large, medium and small-scale atmospheric structures and the physical processes that form, sustain or destroy them. However, interpreting these data is complicated by perturbations caused by a broad spectrum of wave-turbulent motions. To obtain some spectral resolution, but to retain the advantanges of the time-space domain, each signal will be filtered to yield a low-freqency, slowly varying mean, and three to four decades of higher frequency deviations. The means will be combined with radiosonde data to determine the large-scale structures. The deviations will be cross-correlated to determine the heat, momentum, moisture and ozone fluxes in each frequency decade. Also, mesoscale wave theory will be used to identify wave modes. Evaluations of these scale-dependent fluxes are necessary to improve subgrid-scale parameterizations of atmospheric numerical models. In addition to the data reduction and processing described herein, this work will provide meteorological support and guidance for the GAMETAG missions. With only one north-south and one south-north traverse, representative meridional profiles must be based on sampling in representative air masses and their transition zones. With the

direct line from the National Meteorological Center to the National Center for Atmospheric Research, plus isentropic and cross-section preparation and plotting programs, all of the requisite data can be prepared at NCAR. Hand analyses of these charts will make predictions of optimum flight tracks and times.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0028, AERIAL PHOTOGRAPHIC STAND CLASSIFICATION FOR SILVICULTURAL MANAGEMENT OF THE SOUTHERN PINE BEETLE
G.N. MASON, Stephen F. Austin State Univ., School of Forestry, *Nacogdoches, Texas* 75961 (0072114; TEXY00026)

OBJECTIVE: Adapt photo inventory techniques to rate pine stand susceptibility to southern pine beetle attack. Establish the utility of existing space and aircraft imagery in site-stand analysis. Assign susceptibility class to specific stands and test reliability of hazard rating models.

APPROACH: Will be accomplished through milti-level sampling with space and aircraft imagery with 35 mm low-level supplement. Resulting stand maps will be integrated with existing ground and infestation data to establish and test a hazard rating system.

SUPPORTED BY U.S. Dept. of Agriculture, Cooperative State Research Service, Texas

5.0029, CONDITIONS ASSOCIATED WITH AURORAL CURRENT SYSTEMS
R.J. SPIGER, Univ. of Washington, Graduate School, *Seattle, Washington* 98105 (DF248520; F19628-77-C-0042)

AF function - communication, navigation, ionosphere and magnetosphere modelling. Deficiency - inadequate knowledge of transport mechanisms in auroral ionosphere for needs of AF systems. Objective - to compare rocket observations of auroral, field aligned currents with simultaneous Chatanika radar observations to obtain radar signature of these currents. These will be used to identify current electric field relationships by comparing Chatanika observations with those of the AF satellite S3-2. How research contributes - provides data essential to radar propagation through auroral ionosphere, provides data essential for design and utilization of communication guidance and surveillance systems, provides information about satellite charging processes, provides understanding of auroral ionosphere transport mechanisms.

Analyze and synthesize AF satellite data in conjunction with radar backscatter and rocket observations.

ADDENDA: Supporting agency address is: AF Geophysics Laboratory PH Hanscom AFB, Bedford, Mass 01730

SUPPORTED BY U.S. Dept. of Defense, Air Force

5.0030, POTENTIAL ENERGY IN THE EARTH'S CYCLOGENETIC REGIONS DURING DIFFERENT WEATHER REGIMES
L.H. HORN, Univ. of Wisconsin, School of Natural Sciences, *Madison, Wisconsin* 53706 (ATM76-22200)

This research proposes to study the physical characteristics of the earth's surface and atmosphere in the principal extratropical cyclogenetic regions of the earth during various weather regimes. The importance of the cyclone scale and the cyclogenetic process in the atmospheric energy cycle is emphasized. Although there is a definite preference for cyclogenesis to occur in certain geographical areas, particularly along the east coasts of Asia and North America, the location, frequency and intensity of the cyclogenesis varies depending on the weather regime. The question is raised as to whether changes in the large-scale regime are responsible for variations in the pattern of cyclogenesis or whether changes in the surface characteristics (sea surface temperatures, snow cover, etc.) alter the pattern of cyclogenesis which in turn forces changes in the large-scale flow. Quantitative evaluations of the surface and atmosphere during widely differing regimes may contribute to an understanding of this fundamental question. Attention is focused on the generation of available potential energy in the cyclogenetic regions during the different weather regimes. The need for employing the proper form of the generation equation is emphasized, for if the approximate form is used the effect of the transfer of energy from the surface to the atmosphere on the generation is misrepresented. Data gathered during the Air Mass Transformation Experiment of GARP and indirect satellite soundings would be used to supplement the conventional data.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0031, INADVERTENT WEATHER MODIFICATION IN THE ST. LOUIS AREA
A.H. AUER, Univ. of Wyoming, School of Engineering, *Laramie, Wyoming* 82070 (ENV77-12552)

The overall goal of this research is to determine the effects of urban-industrial areas on the local and downwind weather. The objectives include: 1) ascertaining the role of anthropogenically altered land use on weather, 2) deriving heat, moisture and turbulent fluxes within the boundary layer of urban and rural environments in the St. Louis area, 3) developing power-law relationships for modeling wind speed and direction changes with height for airflow across and urban area and its suburbs, and 4) investigating solar radiation effects on the urban atmosphere.

This research continues the analyses of the large amount of data obtained in the St. Louis area from 1971-76 by Project METROMEX (Metropolitan Meteorological Experiment) investigators. This includes data from aircraft, radar, radiosondes and pilot balloons, and surface networks both fixed and mobile. The more than 1200 pibal observations obtained during the summer field expeditions are being examined to generate power-law vertical wind profiles with relevance to locations and fetch over known land use, prevailing approach winds and stability of atmosphere. The turbulence data are being examined to provide information on the spectra of the u, v, and w components of turbulence as well as the spectra of moisture and temperature fluctuations. The analyses of the solar radiation and direct solar beam extinction measurements provide improved knowledge and understanding of the contribution of aerosols to the urban and rural atmospheric energy balance.

This is a continuation of research initiated under NSF award 0ENV73-07881.

SUPPORTED BY U.S. National Science Foundation, Div. of Advanced Environmental Research & Technology

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, AREA OF INTERESTS/FIELD OF VIEW RESEARCH USING ASPT
W.D. LEMASTER, U.S. Air Force, Human Resources Laboratory, *Chandler, Arizona* 85224 (DF223410)

To provide behavioral research data on helmet-slaved and target-slaved area of interest (AOI) visual displays within a wide-angle field of view (FOV). This study will serve as a basis from which to pursue flying training research on a CIG visually coupled system (VCS) incorporated in the helmet device.

Phase I will determine the effect of various FOV sizes on gunnery range weapons delivery and establish minimum acceptable head-slaved FOV visual angle. Phase II will determine interaction between FOV size and head-slaved AOI detail level in tactical weapons delivery. Subsequent phases will establish the flying training benefits of the device in the areas contact airwork and tactical weapons delivery.

ADDENDA: Supporting agency address is: AF Human Resources Laboratory FTR, Williams AFB, Arizona 85224

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0002, CREW WORKLOAD/SIZING REQUIREMENTS
B.M. CRAWFORD, U.S. Air Force, Aerospace Medical Res. Lab., *Dayton, Ohio* 45433 (DF321030)

The objective of this work-unit is to establish a quantitative basis for specifying system manning levels (crew sizes) consistent with actual workloads dictated by mission demands. The associated methodology will be derived from information flow rates, information processing functions and information metrics critical to mission performance goals. The quantitative methodology and data base, when combined with task and time line analyses during system design, will result in more efficient crew system performance and minimize the number and cost of system modifications. Special attention shall be given to assuring integration of crew capabilities with computer aiding techniques. This effort supports AFSC development goals, TC-1, TC-2, TC-7, C3-3, RI-1, and MS-4.

Specific directions for this effort will be derived initially from reviews of ongoing crew sizing evaluations for the C-135, C-141, C-5, AMST and ACTA systems. Techniques currently being developed by AMRL to assess task load capabilities of individual operators in terms of basic information/task parameters and information processing functions will be adapted to incorporate crew interactions, time and task sharing effects. The quantitative methodology as developed will be pre-tested on multi-man system simulations in the amrl computer simulations facility. The resultant quantitative transfer functions, expressive of relationships between interface design, processing functions, rate of information input and mission task effectiveness criteria, will be (1) integrated with a computer-based system analysis program (e.g., SAINT), (2) documented in procedural handbook form, and (3) validated on a new multi-man system development effort.

ADDENDA: Supporting agency address is: 6570 Aerospace Medical Rsch Lab HE, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0003, HUMAN CAPABILITIES IN INFRASOUND

D.L. JOHNSON, U.S. Air Force, Aerospace Medical Res. Lab., *Dayton, Ohio* 45433 (DF321360)

Various AF noise environments contain high-intensity acoustic energy in the frequency range below approximately 16 Vz (infrasound). Although this very low frequency energy has little effect on hearing it may adversely influence physiological functioning, psychomotor and cognitive performance. The objective of this research is to systematically investigate the effects of infrasound exposures on the capabilities of human subjects to perform selected tasks. The threshold of these effects, the nature and extent of the interference and the overall performance limits will be defined in terms of the acoustic exposures. This effort will provide support for the whole body exposure effects standards sections in AFR 161-35.

The approach is to systematically examine the effects of infrasound on a variety of tasks, performed by human volunteers, that might show differential effects due to the very low frequency energy. The nature and difficulty of the tasks (psychomotor, visual search and cognitive) will be varied together with the frequency, duration and intensity of the infrasonic stimulus in an effort to identify variables in the stimulus, task or subject that might result in reduced human capabilities. A substantial technology base describing human performance in infrasound will be realized when these results are integrated with those from earlier efforts. This work is possible only because of the unique dynamic pressure chamber at AMRL.

ADDENDA: Supporting agency address is: 6570 Aerospace Medical Rsch Lab BB, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0004, FLYING TRAINING RESEARCH SUPPORT SERVICES

D. WHITFORD, Univ. of Dayton, Res. Inst., *Dayton, Ohio* 45409 (DF223190; F33615-77-C-0054)

(1) To obtain quick-response flying training research products through a university-based contract which utilizes Air Force Human Resources Laboratory (AFHRL), Flying Training Research Division (FT) research facilities and/or the facilities of the university itself. (2) To provide expert outside consultation to AFHRL/FT personnel concerning selected flying training problem areas.

The multidisplinary capabilities of a university will be used to obtain flying training research on a number of high-impact research questions. The research requirements for each research project will be designed to allow full autonomy of contractor effort. On an as-required basis, university consultants will also be utilized to update or augment AFHRL/FT staff knowledge concerning critical research topics.

ADDENDA: Supporting agency address is: AF Human Resources Laboratory FT, Williams AFB, Arizona 85224

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0005, MIXED MEDIA-FILTER FOR AIRCREW BREATHING SYSTEMS

G.V. COLUMBO, Umpqua Research Co., *Myrtle Creek, Oregon* 97457 (DF320320; F33615-76-C-0603)

The purpose of this work-unit is to provide a comprehensive and experimental study of mixed silica gel and charcoal as a dryer/filter system for oxygen purification. These dryer/filters are to be employed on advanced military aircraft using chemically based oxygen generating systems. This effort supports ASD/AEL (B-1 OLOGS).

The study shall include (1) an investigation of simple mixtures of silica and charcoal, and (2) the product of the precipitation of charcoal dispersed in a solution of sodium silicate. Sorbent concentrations shall be varied such that water vapor absorption, contaminant (5 separate organic compounds) absorption, flammability, and regeneration criteria can be established in an atmosphere of 100 percent oxygen.

ADDENDA: Supporting agency address is: USAF School of Aerospace Medicine VN, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0006, MEASUREMENTS IN THE LASER IRRADIATED EYE

A.J. WELCH, Univ. of Texas, School of Engineering, *Austin, Texas* 78712 (DF048650; AF-AFOSR-3314-77)

AF function - Air Force personnel may be exposed to a wide spectrum of radiation hazards in the operation of aircraft and weapon systems. This spectrum includes laser energy. The results of the measurements proposed should substantially contribute to work being conducted by USAFSAM in TPO II, radiation hazards. Deficiency - techniques are needed to develop microsensors which are capable of acquiring data in the pulse duration phase associated with most Air Force lasers. It seems probable that the development of these microsensors will add substantially to the attainment of means of direct measurement of temperatures during short-duration exposure of the eye and for small retinal images. In addition, the investigators will measure the transmission properties of the monkey eye by the use of a dye laser. Objective - this research will lead to intensity and electrical activity within the laser irradiated eye. In addition, measurements of the transmission properties of the eye will be accomplished with the use of a dye laser. How research contributes - the need for determination of safe retinal exposure levels to high-intensity visible light increases each year. The health hazards of these sources cannot be properly evaluated until we increase our knowledge of the nature of the damage mechanism and are better able to measure these effects. This research will afford the means to more accurately assess and quantify the effects of laser irradiation on the eye.

Measurements in the laser irradiated eye will be made by the insertion of newly developed fiber optic probes as well as from combination fiber optic - thermocouple probes and combination electrode - thermocouple probes. The probes will be inserted in monkey eyes. By scanning the animal through the laser beam, it should be possible to produce high-quality two-dimensional intensity profiles of the retina. Also simultaneous light - temperature recording or ERG - temperature recordings will be made using the rabbit and/or monkey.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NL Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0007, THERMAL AND RESPIRATORY STANDARDS FOR FIREFIGHTER PROTECTIVE EQUIPMENT
F.W. BAUMGARDNER, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF322680)

To develop integrated system design criteria for firefighters' protective garments and breathing apparatus, based on physiologic requirements and limitations. Acknowledged complaints of firefighters include the weight, bulk, limited use time and questionable efficiency of the breathing apparatus. No study to date has quantitated the physiologic consequences of using commercially available respirators over a broad range of workloads. Metabolic requirements and weight penalties of performing operational tasks such as climbing, lifting and bending while wearing a firefighters' life support and protective equipment have not been assessed. Interactive effects of thermal stress imposed by protective equipment, external heat leads and metabolic and respiratory stress impose physiologic limitations on firefighters and reduce endurance. Specific objectives of this efforts are to quantitate the reduction in work capacity effected by the weight of a self-contained respirator and protective clothing, to assess additional physiologic effects of thermal stress and respirator limitations, and to build an appropriate physiologic data base required to establish equipment design criteria.

Twenty subjects including smokers and non-smokers will perform treadmill exercise over a wide range of workloads and will perform other tasks such as climbing, bending and lifting. Ekg, heart rate, O2 and CO2 concentrations, breathing resistance, peak flows, skin and core temperatures will be monitored continuously. O2 consumption, pulmonary ventilation, and blood lactate and carboxyhemoglobin concentrations will be determined. Endurance decrements and physiologic limitations imposed by a self-contained respirator and/or wearing firefighters' protective clothing will be assessed. Both thermal and respiratory stresses will be considered.

ADDENDA: Supporting agency address is: USAF School of Aerospace Medicine VN, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0008, CRITERIA SUITABLE FOR G-SUIT/G-VALVE EVALUATION IN A HIGH G ACM ENVIRONMENT
R.R. BURTON, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF322330)

To develop criteria useful in evaluating g-protection resulting from anti-g suits and valves during aerial combat-type acceleration exposures.

A simulated aerial combat maneuver (SACM) developed in 7930-03-49 will be used testing plag seat 2 which is capable of several seat back angles offering various levels of relaxed g-tolerance. Several physiologic parameters will be determined during exposure to the SACM. Relaxed g-tolerances will be correlated with these parameters and the duration of SACM tolerated by several subjects. A significant correlation will verify the use of the SACM as a method of quantifying tolerance to a high variable g-environment and as a tool useful in measuring ACM type of g-protection resulting from the use of anti-g suits and valves.

ADDENDA: Supporting agency address is: USAF School of Aerospace Medicine VN, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0009, BIOCHEMICAL LONG-TERM RISK FUNCTION EVALUATION
D.A. CLARK, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF321890)

The objective of this work will be to test the predictive power of biochemical measurements suspected to be involved in the development of atherosclerosis in USAF aircrew. This is necessary because the extent of coronary artery disease (CAD) in susceptible individuals cannot be completely predicted using the present accepted risk factors for CAD.

The laboratory accuracy and precision of possible biochemical risk factors will be defined and improved as much as possible. If appropriate, determinations will be made on patients having had coronary angiography as part of their routine evaluation. The laboratory data will be tested statistically to determine if the biochemical measurement discriminates between patients with and without coronary artery disease. Progress under this work unit was previously documented under 7755-05-07.

ADDENDA: Supporting agency address is: USAF School of Aerospace Medicine NG, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0010, DT&E SUPPORT TO TAWC AIRCREW EQUIPMENT TEST
R.C. LIGDAY, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF320370)

This effort provides expertise and instrumentation to determine the quality and build-up of toxic gases in and around AF weapons systems during DT&E and IOT&E at TAWC, Eglin AFB, Florida.

The USAFSAM will provide, for various applications, the instrumentation to detect and quantitate toxic gases evolved from various Air Force weapons systems. The instrumentation and techniques to be used have been developed during USAFSAM studies at Eglin AFB (7930-10-16) and Edwards AFB (7930-10-10).

ADDENDA: Supporting agency address is: USAF School of Aerospace Medicine VN, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0011, OIL VAPOR LIMITS FOR TURBINE BLEED AIR FOR A FLUOMINE OXYGEN CONCENTRATOR SUBSYSTEM
L.J. LUSKUS, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF322220)

To provide information on contaminant effects on the fluomine open loop oxygen generating system (OLOGS) and purity of the oxygen product in support of OLOGS development. Previous accomplishments in the area of OLOGS oxygen purity are documented under work unit 71641604. This work unit is established to implement a new technology planning objective as directed by HG Aerospace Medical Division.

Test fluomine system for performance when subjected to bleed air containing engine oil, combusted engine oil, and hydraulic fluids which could result from engine failure. The tests will be a cooperative effort between Garrett/Airesearch, 412A LSSPO and USAFSAM to validate the safety of the prototype OLOGS.

ADDENDA: Supporting agency address is: USAF School of Aerospace Medicine VN, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0012, USAF CENTRALIZED WAIVER REPOSITORY (WAVR FILE)
G.O. TOLAN, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF322050)

To tabulate in a readily available computerized form the essential medical data on rated personnel who receive waivers for medical defects in order to continue flying duties. To provide to the Surgeon General, USAF, and to the surgeons of the major air commands, on a periodic basis, the information required to assure timely administrative review of waivers and appropriate evaluation or reevaluation of significant medical problems in flying personnel.

AFM 160-1, paragraph 3-6D(6), requires submission of identification and medical data to USAFSAM by waiver authorities every three months. Information from the USAF Military Personnel Center regarding changes in base and command of assignment is also entered. Publication of the file is also accomplished on a quarterly basis. In addition to a master file, or complete list, sent to the Surgeon General's office, each major air command surgeon's office is furnished with a list of individuals within that command and a suspense list (by waiver expiration date) for the following three months. Capability will be maintained for searching the file for any diagnostic or other medical terms and will be responsive to requests from the major air command or Surgeon General's office to provide information as required. Work was formerly documented under work unit 7755-14-02.

ADDENDA: Supporting agency address is: USAF School of Aerospace Medicine NG, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0013, STEREO ACUITY
T.J. TREDICI, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF323040)

The traditional decision point in ophthalmologic considerations regarding flying status has been differentiating those individuals with a phoria from those with a manifest deviation or tropia. Those with tropias (crossed eye) have not been qualified for flying status because of defective stereoscopic vision and their almost universal failure of the depth perception tests. A distinct category of patients between these two extremes has not been identified in the patient population of the Aeromedical Consulation Service. These individuals do indeed have a tropia but one of extremely small degree. These individuals do retain some degree of stereoscopic vision, and many can pass one of the USAF depth perception tests. The term developed for this type of disorder is 'microtropia.' Following a battery motility testing procedures, a number of USAF flying personnel have been recommended for waiver for continued flying status. Since this is a totally new entity in the ophthalmologic field, the true nature of the process, its causes and ultimate prognosis -- i.e., progression to greater visual disability--are not yet clearly delineated. The objective of this workunjt is to continue to follow such patients over time to provide the presently lacking new knowledge and to validate the established policy of continued flying for individuals with this condition. New stereoscopic testing equipment needs to be developed. Presently available testing devices are not sufficiently sensitive to carry out some of the tests desired.

Those USAF aircrew referred to the Ophthalmology Branch, Clinical Sciences Division, who have failed the USAF stereoscopic depth perception test will be put through an extensive battery of diagnostic tests to determine the cause of their failure. If the etiology of their failure is microtropia, they will be followed under this unit for aeromedical assessment regarding stability or progression. As new knowledge regarding this entity is developed, it will be transmitted to the field for utilization in all Air Force medical facilities and further disseminated to civilian and military ophthalmological community through publication of scientific papers. An attempt will be made to develop new and more refined stereoscopic testing devices by contractual effort. Work was formerly conducted under work unit 77550905.

ADDENDA: Supporting agency address is: USAF School of Aerospace Medicine NG, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0014, THALLIUM 201 MYOCARDIAL IMAGING
J.H. TRIEBWASSER, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF321730)

To develop a noninvasive method for detection of myocardial ischemia in USAF flying personnel.

Patients seen by the Aeromedical Consultation Service for evaluation of abnormal exercise tests will be injected with 2 uci thallium 201 at maximum exercise. Statis scans will be made after an eight-minute recovery period. Scans will be interpreted for areas of ischemia. The results of the scan will be compared to results of coronary angiograms to determine whether significant coronary artery disease can be detected on scan.

ADDENDA: Supporting agency address is: USAF School of Aerospace Medicine NG, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense, Air Force

MATHEMATICAL AND COMPUTER SCIENCES

Includes Mathematical and Computer Sciences (general); Computer Operations and Hardware; Computer Programming and Software; Computer Systems; Cybernetics; Numerical Analysis; Statistics and Probability; Systems Analysis; and Theoretical Mathematics.

7.0001, RECONFIGURING SOFTWARE AND SYSTEMS
A. KLINGER, Univ. of California, School of Engin. & Appl. Sci., *Los Angeles, California* 90024 (INT76-05767 A01)

This award will supplement a small grant (INT76-05767) made in the Spring of 1976, to allow the completion of a variety of studies in reconfiguring software and systems. These studies are being carried out cooperatively between Allen Klinger of UCLA and J.M. Garduno of the National Autonomous University of Mexico. Their effort is concentrated on developing refined applications of pattern recognition methods in advanced engineering systems. Applications will include computer processing of remote sensing and other geographic data, and monitoring of seismic data from a large number of detectors.

The supplementary funding will allow special attention to be given to 'relational indexing', a software method that allows a user to manipulate portions of map-like data sets. This work involves collaboration with Gerry Marten of the Mexican Institute for Research on Biological Resources.

SUPPORTED BY U.S. National Science Foundation, Div. of International Programs

7.0002, RESEARCH IN NUMERICAL MATHEMATICS
W.B. GRAGG, Univ. of California, Graduate School, *San Diego, California* 92037 (DF049230; F49620-77-C-0108)

AF function - the design of hardened electronic devices. Opportunity - electronic devices in aerospace vehicles may be exposed to external threats like electromagnetic pulses (EMP) generated by nuclear devices. It is very important to determine the electric fields generated by EMP in the surface as well as in the internal parts of the vehicle. This research presents a distinct approach for computing the internal currents in bundles of wires. Objective - to continue research efforts in the area of nonlinear least squares problems. In particular, this work will seek extensions of cyclic rank one update methods developed by the proposer. How work contributes - techniques may be developed which could enhance the design of hardened electronic devices for aerospace vehicles.

This research will investigate extension of the basic theory for nonlinear least squares for the purpose of making the following extensions: (1) an asymptotically equivalent version of the cyclic rank one update previously developed, (2) extension to SOR and SSOR updating methods, (3) extension to methods based on Chebyshev semi-iteration, and (4) adaptation of the conjugate gradient method, as a generalization of (3).

ADDENDA: Supporting agency address is: AF Office of Scientific Research NM Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

PHYSICS

Includes Physics (general); Acoustics; Atomic and Molecular Physics; Nuclear and High-energy Physics; Optics; Plasma Physics; Solid-state Physics; Thermodynamics and Statistical Physics. For Related Information See Also Engineering.

8.0001, HIGH-TEMPERATURE STABILIZATION OF THIN METAL FILMS
B.O. SERAPHIN, Univ. of Arizona, School of Liberal Arts, *Tucson, Arizona* 85721 (DMR75-01267 A01)

This is a continuation of a basic investigation of stability characteristics of thin metallic reflector films at elevated temperatures. To date, silicon dioxide films thinner than 500 A were found to stabilize silver films against deterioration of their infrared reflectance up to temperatures in excess of 800 degrees in air. Using pinhole formation and the subsequent increase of transmission through the films as a measure of agglomeration tendency, the deterioration process was followed quantitatively as a function of annealing time and temperature. It is hypothesized that the stabilizer oxide layer is effecting the observed enhancement in film stability by one or more of three mechanisms: a barrier action to block oxygen diffusion, the reduction of surface self-diffusion of silver, and/or the mechanical restraint of Hillock formation. During the renewal period, the fractional contribution of these three mechanisms will be determined, by independently varying the oxygen diffusion rate and the film stresses which drive Hillock formation. In addition, the use of precipitation hardenable and dispersion strengthened alloy films with increased high-temperature strength to resist induced surface reconstruction will be studied. Lastly, the possible agglomeration of thin gold films will be investigated to determine whether the mechanisms elucidated by this study are peculiar to silver films. This is a renewal of NSF grant DMR75-01267.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0002, HIGH-ENERGY PHYSICS STUDIES
J. SCHULTZ, Univ. of California, School of Physical Sciences, *Irvine, California* 92664 (EY-76-S-03-0034 PA 149)

Principal goals of the proposed work are a search for resonant and bound states in the nucleon-antinucleon system, elucidation of mechanisms of p annihilation in deuterium, and comparison of phenomena in pd interactions with results previously obtained in pp studies. Several theoretical approaches lead to predictions of a rich spectrum of states near NN threshold. The search for such new states involves an approved experiment to be run at Brookhaven National Laboratory (AGS-701), where an array of counters, multi-wire proportional chambers, and NaI detector will be used to observe outgoing charged pions, photons, and recoil nucleons from p annihilations in deuterium. Bound and resonant states will be observed by means of recoil nucleon spectroscopy, and radiative or pionic transitions between postulated levels can also be detected. The experiment is a collaborative effort with the University of New Mexico and Temple University. In addition, analysis of several pd bubble chamber exposures is underway. These experiments include: 1) a 240,000 picture exposure in the Argonne National Laboratory 12-foot chamber with p's from 700 MeV/c to stopping, and 2) an 80,000 picture exposure in the Brookhaven National Laboratory 30-inch chamber, at 600, 740 and 905 MeV/c. Of particular interest are events with V's, gamma's, and recoil spectator protons. Events with gamma's, and recoil protons will complement data from the counter experiment search for new states. The gamma's will also be used to fit final states involving more than one neutral pion. Strange particle events will be used for comparison with previous pp results, and to study annihilation mechanisms in the particularly interesting channel pd yields lambda plus anything, which involves both nucleons of the deuteron target.

RESULTS: The counter experiment search for NN states is in the initial stages of preparation. Scanning and measurement of strange particle events in the BNL exposure are essentially complete, and some preliminary data are available. Partial scanning of the ANL film has been accomplished, but analysis is just getting underway.

SUPPORTED BY U.S. Energy Research & Development Admin., Div. of High Energy & Nuclear Physics

8.0003, PLASMA PHYSICS
B.D. FRIED, Univ. of California, School of Letters & Science, *Los Angeles, California* 90024 (PHY77-12873)

Theoretical research in fundamental nonlinear plasma physics initiated under NSF grant PHY75-07909 A01 will be continued. Three principal areas are to be investigated: (I). Solitary wave structures in both unmagnetized and magnetized plasma. This includes the study of the evolution of Langmuir solitons in the presence of small perturbations; nonlinear drift wave phenomena; statistical theory of a system of large number of solitons; and the resonance absorption of electromagnetic waves in magnetized plasma. (II). The kinetic approach to theories of low-frequency electromagnetic instabilities in general magnetic field geometries. Among the topics to be studied will be the linear and non-linear theories of kinetic tearing mode instabilities, as well as internal kink-like instabilities and the nonlinear evolution of kinetic drift wave instabilities and related energy transport phenomena. (III). Strong turbulence theory in plasmas, including the nonlinear-Schrodinger equation model of strong plasma turbulence; parametric processes in turbulent media; and cyclotron heating in a toroidal magnetic field.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0004, THEORETICAL HIGH-ENERGY PHYSICS
R.E. NORTON, Univ. of California, School of Letters & Science, *Los Angeles, California* 90024 (PHY76-23467 A01)

Research activities will include work on: Classical Solutions of Non-Abelian Gauge Theories; Neutral Currents; Neutrino Physics; Statistical Physics; Infrared Confinement; Dynamical Symmetry Violation; Mathematical Physics; Lepton Induced Reactions; Phenomenology; Magnetic Monopoles and Dyons.

This work is a continuation of that currently supported by NSF Grant PHY75-01270 AO1.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0005, INVESTIGATIONS OF AN IDEAL CONFINEMENT CONCEPT AND ELECTRON-ION TWO-STREAM INSTABILITIES
A.Y. WONG, Univ. of California, School of Letters & Science, *Los Angeles, California* 90024 (PHY77-07160)

Research will continue on several topics of nonlinear plasma physics, including the formation of potential double layers, Bunomann instabilities, and the interaction of cavitons. In addition, a new confinement system will be constructed and utilized, which will be a superconducting SURMAC device. This will approximate an ideal confinement system by eliminating most of the conventional plasma losses.

This work is a continuation of that currently supported under NSF grant number PHY75-18165A01.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0006, STUDIES IN SPECTROSCOPY AND QUANTUM ELECTRONICS
A.L. SCHAWLOW, Stanford University, School of Hum. & Sciences, *Palo Alto, California* 94305 (PHY77-09687)

The application of modern optical devices, such as advanced kinds of lasers, is proposed for basic studies in physics. In the course of these studies the laser techniques will be refined and extended, and new sensitive methods of laser spectroscopy will be explored and developed. The extremely high resolution permitted by the techniques of Doppler-free nonlinear spectroscopy (saturation, polarization, two-photon) will be used to study fine and hyperfine structures in spectra of atoms and simple molecules. Use of short laser pulses in new ways for high-resolution spectroscopy, and the extension of high-resolution methods to shorter ultraviolet wavelengths are planned. The spectrum of simple one-electron atoms will be studied in high resolution, to probe the limits of quantum electrodynamics, and to improve the values of fundamental constants. Saturation and polarization labeling techniques will be used and extended to simplify the analysis of complex atomic and molecular spectra. New techniques for measuring wavelengths and frequency intervals will be developed and studied. Laser methods for the ultrasensitive and highly selective detection of atoms and molecules will be explored. The development of a dye-laser-like tunable ultraviolet laser, pumped by a molecular hydrogen laser, which would be a valuable tool for laser studies of atoms and molecules is also planned.

This work is a continuation of that currently supported under NSF grant PHY74-14786A03.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0007, EXPERIMENTAL STUDY OF ELECTRON-MOLECULE (ATOM) COLLISION PROCESSES
S. TRAJMAR, U.S. Natl. Aero. & Space Adm., Jet Propulsion Laboratory, *Pasadena, California* 91109 (INT76-22192)

This collaborative research project involves Dr. Sandor Trajmar of the Jet Propulsion Laboratory (Pasadena, California), with Drs. Sergio Porto, George Csanak, and Dimitrios Bozinis of the University of Campinas (Campinas, Brazil).

NSF is contributing to the linkage of these scientists for the purposes of expanding their research efforts in electron-molecule (atom) collision physics. The joint research efforts will be concentrated in areas which are of importance from the point of view of laser and plasma physics, isotope separation, and surface chemistry and physics. Three specific research areas have been chosen: a) Electron scattering from atomic and molecular beams. This will involve experimentation with lasers in metal vapors, and

vibrational excitation of diatomic and polyatomic molecules. b) Isotope separation. Exploratory research on isotope separation through combinations of laser photoexcitation followed by selective photoionization or chemical reactions will be carried out. c) Electron scattering from surfaces. Here planning and feasibility studies will be done to utilize low- and intermediate-energy elastic and inelastic electron scattering for probing surfaces.

The laboratory measurements will be carried out at JPL by the two main investigators from each country. The evaluation and interpretation of the results will be shared and carried out at Campinas and JPL, and will be closely correlated with ongoing theoretical work at Campinas under Dr. Csanak.

SUPPORTED BY U.S. National Science Foundation, Div. of International Programs

8.0008, NUCLEAR RESONANCE AND RELAXATION IN METALS & SUPERCONDUCTORS

D.E. MACLAUGHLIN, Univ. of California, Graduate School, *Riverside, California* 92502 (DMR77-09403)

Research begun under DMR 73-02395 will be completed. Nuclear Magnetic Resonance techniques will be used to probe the local magnetic field in metals and superconductors. NMR measurements of magnetically ordered states of the spin glass systems Cu Mn and (La, Gd) Al2 will be undertaken to study the local magnetic fields and the characteristic relaxation times. Anomalous behavior in the host resonance line widths for low Mn concentrations have been found in Cu Mn and these will be investigated further. Superconducting aluminum alloys will be studied to determine the 27Al relaxation rates in the presence of resonant-state 3d impurities such as V, Cr, and Mn.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0009, THEORETICAL STUDIES OF INHOMOGENOUS ELECTRONIC SYSTEMS IN SOLIDS

H.B. SHORE, Calif. State Univ. & Colleges, School of Science, *San Diego, California* 92115 (DMR77-11532)

Theoretical investigations in solid-state physics previously supported by NSF grant DMR-7203107 A01 will be continued and extended in new directions. Calculations will be done on the surface energy of simple metals within the density functional formalism of Kohn and Sham, using newly developed non-local corrections to the exchange-correlation energy. The methods used for this calculation will also be applied to other problems involving the inhomogenous electron gas: the energy of solution of hydrogen in metals using the spin-dependent version of the density functional formalism and the behavior of the above calculation in the limit of very low electronic density. Also, inhomogenous electron gas methods will be applied to the problem of the electron-hole liquid in semiconductors. Problems to be investigated include the surface energy of a droplet, the binding energy of the liquid to an impurity, and the stabilization energy of exciton complexes by a point charge. Included also will be study of lithium impurities in silicon.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0010, THEORY OF ELECTRON AND LATTICE DYNAMICS IN SOLIDS

L.J. SHAM, Univ. of California, Graduate School, *San Diego, California* 92037 (DMR77-09595)

Three topics in the theory of electron and lattice dynamics in solids will be investigated: (1) The dynamics of electrons trapped in the semiconductor-oxide interface of a metal-oxide-semiconductor junction, with particular emphasis on superconductivity due to the dielectric influence of an insulator layer, validity of the effective mass approximation, the electron-electron interaction and the electron-phonon interaction. (2) The electronic contribution to lattice vibrations of crystals with surfaces, including the effective charge of semi-infinite ionic crystals or slabs. (3) The exact solution of the first-order change in the wave function of an electron in the Kronig-Penney model under perturbation to study the convergence rate of the usual first-order perturbation expression in terms of an infinite series of unperturbed states, and, if necessary, the development of variational and other methods for the first order change in the wave function.

This is a continuation of research previously supported under DMR73-07593.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0011, RESONANCE STUDIES OF SUPERIONIC CONDUCTORS

V. JACCARINO, Univ. of California, School of Letters & Science, *Santa Barbara, California* 93106 (EY-76-S-03-0034-244)

This project is a continuing combined nuclear magnetic resonance (NMR) and electron paramagnetic resonance (EPR) study of the superionic conductor PbF2 and related ionic compounds. The novel feature of the work is the recognition that paramagnetic ions alter the characteristic properties of the resonance through the combined effects of diffusive motion and interaction with the electronic spin moments.

Specific continuing NMR and EPR topics to be studied in Mn doped PbF2 include: F19 motion in the highly doped samples (including a puzzling shifted resonance in the middle temperature range), the possibility that PbeMnF6 may be a superionic conductor, and the broadening of the high-temperature EPR in Mn:PbF2 which is indicative of a strong frequency dependence to the modulation of the hyperfine field.

The F19 in the higher concentration Mn:PbF2 samples will be used to probe the microscopic properties of mixed phases in the solid, solid-liquid and liquid phase regions. As a complementary study, the conductivity of the mixed systems will be examined since it appears that the conductivity of some mixed systems (e.g., MnF2:ZnF2) may be lower than either constituent.

EPR will be used to study the phase transition in PbF2 at 310 degrees centigrade. This technique makes it possible to determine whether there is any 'critical-like' divergence in the crystal field parameters as the transition is approached. Additionally, apparatus to allow an HF atmosphere to be maintained around the samples is being constructed in order to minimize effects of sample reactions at the higher temperatures.

SUPPORTED BY U.S. Energy Research & Development Admin., Div. of Basic Energy Sciences

8.0012, CONDENSED MATTER SPECTROSCOPY

W.C. WALKER, Univ. of California, Graduate School, *Santa Barbara, California* 93106 (DMR77-09954)

Spectroscopic investigations of solids previously supported by NSF grant DMR7202991 will be continued and extended to new systems of interest. Three related research topics will be addressed. These include: 1) the electronic properties of heteronuclear excimers in solids, excimers of interest include Krypton-Oxygen and Xenon-Fluorine which result from both direct excitation and interaction with the self-trapped exciton in rare gas solids doped with diatomic and polyatomic molecules; 2) the electronic and vibrational properties of molecular solids; and 3) the electronic and vibrational properties of molecular solids disordered by heavy doping with various molecules. In support of this work studies on a variety of the halogen- and chalcogenide-containing pure molecular solids mentioned above, as well as others will be pursued. The experimental techniques to be used are those of low-temperature spectroscopy, including absorption, photoluminescence and photo-yield spectroscopy and lifetime measurements in the spectral range 2 to 30 electron volts. Derivative spectroscopy, particularly thermal modulation, will be used to study fine structure such as that due to persistent vibrational states in the solid phase. The experiments will be done with both conventional sources at Santa Barbara and with sub-nanosecond pulsed, synchrotron radiation at the Stanford Synchrotron Radiation Project.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0013, CONTROLLED THERMONUCLEAR REACTORS & HIGH-TEMPERATURE PLASMA COLLISION PARAMETERS

D. NORCROSS, U.S. Dept. of Commerce, Natl. Bureau of Standards, *Boulder, Colorado* 80302 (2741540 (NBS NO.))

PURPOSE: To determine and disseminate for use collisional and radiative properties of ions, atoms, and molecules needed for development, diagnosis, and modeling of plasma and hot gas systems such as MHD generators and controlled fusion reactors.

OBJECTIVES: To develop measurement and calculational methods to determine excitation cross sections of ions which are needed in development of fusion reactors and MHD generators. Make measurements on ions of most prevalent fusion impurities, C, O, N, as well as other key species which will test the theory. Use theoretical methods to obtain scattering and excitation data needed specifically for MHD generators and fusion reactors.

FY77 MILESTONES: Complete and publish calculations of electron impact excitation cross sections for He-like ions, and Be ion. Measure cross sections for excitation of the 23P level of the He-like ion, Li ion and of the 52p level of Zn ion. Develop techniques to measure cross sections for excitation of multiply charged ions, and make measurements for C ion3 and N ion4. Determine cause of significant differences between results of distorted wave procedure and other calculations for electron impact excitation of He-like ions.

ACCOMPLISHMENTS: Made detailed study of electron scattering on LiF. Built new apparatus at Oak Ridge, N.L., tested, and obtained data on electron impact excitation of C ion 3---first measurements ever on a multiply charged ion. Did analysis and wrote manuscript for publication on electron-impact excitation of Be ion.

BIBLIOGRAPHIC REFERENCE: G.H. Dunn, 'Electron Impact Ionization,' IEEE Trans. Nucl. Sci. NS-23, 929 (1976).

SUPPORTED BY U.S. Energy Research & Development Admin., Unspecified Unit

8.0014, THEORY OF MANY-BODY PROCESSES IN CHEMICAL PHYSICS

W.P. REINHARDT, Univ. of Colorado, School of Arts & Sciences, *Boulder, Colorado* 80302 (CHE77-16307)

Reinhardt and co-workers will continue to develop and to exploit ideas of I2 discretization of the continua involved in scattering, photoabsorption, and intense field multiphoton absorption and ionization, with special attention paid to the multiple continua which arise in single photon double electron ejection, heavy particle impact dissociation, and intense field processes. Systems such as H, He, O2, N2, NH, NH2, CH3-, LiF-, NaCl-, He2 ion, Ne ion will be involved in such studies. In related areas they will investigate the use of Lie group techniques and classical and semiclassical methods to obtain improved understanding and predictive abilities in dealing with atoms and molecules in highly excited states, and in intense field processes. Taking further advantage of recent rapid developments in classical and semiclassical mechanics, they will undertake development of a new formulation of unimolecular processes. Finally, beginning with the recent synthesis of scattering data suggested by the surprisal techniques of Levine and Bernstein, an attempt will be made to develop a formulation of quantum scattering theory appropriate to direct determination of various moments of the S-matrix, rather than the whole S-matrix itself.

This research represents a continuation of that currently supported by Foundation grant CHE-7419605.

SUPPORTED BY U.S. National Science Foundation, Div. of Chemistry

8.0015, INTERMEDIATE-ENERGY PHYSICS

E. HADJIMICHAEL, Fairfield University, School of Arts & Sciences, *Fairfield, Connecticut* 06433 (PHY76-12853 A01)

Research initiated under NSF grant PHY74-14677 AO1 will be continued. The investigation of mesonic-exchange phenomena and their effect on the magnetization and charge density of few-nucleon nuclear systems will be continued. In particular, the compatibility among different approaches to our understanding of mesonic-exchange processes in a nuclear medium will be examined. Furthermore, our knowledge of these processes, in conjunction with elastic and quasi-elastic data for electron scattering from 2H, will be utilized for the purpose of deriving an unambiguous picture of the electromagnetic structure of the neutron. Finally, the presently incomplete investigation of electron-scattering form factors of 2H and 3He will be completed, with special emphasis on all potentially profitable regions of momentum transfer.

The analysis of pi-nucleus scattering by means of a diffractional model will be continued. This model incorporates parameterized complex pi-nucleus phase shifts and is free from some of the uncertainties and limitations of microscopic theories and optical potential models that are based on pi-nucleon amplitudes.

Lastly, the momentum dependence of the pion-nucleon interaction which heretofore has been represented by a form factor of arbitrary form will be examined in a scheme which utilizes experimental pion-nucleon phase shifts and inverse scattering procedures.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0016, RADIATIVE AND NONRADIATIVE PROCESSES IN MOLECULES AND MOLECULAR CRYSTALS

S.D. COLSON, Yale University, School of Chemistry, *New Haven, Connecticut* 06520 (CHE75-13771 A03)

Dr. Colson intends to continue a program of research, currently supported by Foundation grant, GP-28253A1, involving studies of fundamental processes in molecules and molecular crystals. A new experimental approach is planned to measure directly the competing radiative and nonradiative processes responsible for the decay of a photoexcited state. A spectrometer will be constructed to measure simultaneously the absorbtion, emission excitation and opto-acoustic excitation spectra of a molecule or molecular crystal. This 'three dimensional' spectrometer will not only yield new and quantitative data essential to the fundamental understanding of these decay processes but will provide a quantitative basis for the interpretation of vibronic intensities observed in one and two photon emission excitation spectra. The spectrometer will be used to study the low-lying triplet states of pyridine and substituted pyridines where the nature of the decay processes and the ordering of states is still in question. The opto-acoustic detection technique will be extended for use on low-temperature solids to reveal the influence of exciton trapping, annihilation and exciton phonon coupling on the radiative and non-radiative processes in solids.

SUPPORTED BY U.S. National Science Foundation, Div. of Chemistry

8.0017, POSITRONIUM RESEARCH

V.W. HUGHES, Yale University, Graduate School, *New Haven, Connecticut* 06520 (PHY74-13538 A03)

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0018, MEASUREMENT OF THE ELASTIC FORM FACTORS OF HELIUM 3 AND HELIUM 4

B.T. CHERTOK, Amer. University, School of Arts & Sciences, *Washington, District of Columbia* 20016 (PHY75-15986 A01)

This experiment will measure the elastic electron scattering cross section from 3He and 4He at ten values of momentum transfer, q2, in the range 0.8 less than or equal to q2 less than or equal to 4 GeV2 at the Stanford Linear Accelerator Center.

The momentum transfer spans the range between traditional nuclear physics on the low end where electron scattering is interpreted as a probe of the charge distribution of nucleons in the nucleus to the high end where the point-like quark constituents of the nucleons may determine the form factor. This investigation follows the measurement by the same group of the deep structure of the deuteron, in 1974, using the same technique of high-energy elastic electron scattering. The deuteron experiment has given the first evidence that this elementary atomic nucleus of one neutron and one proton may be composed of six point-like quarks at very small distances. The helium measurements could confirm the smooth transition of matter from nucleons to quarks constituents

as observed in deuterium and therapy provide a significant link between nuclear structure physics and high-energy particle physics. Thus the purpose of this new investigation is to see whether the simple features observed in that earlier experiment are visible in the helium nuclei and are therefore conceivably a general property of matter.

This work is a continuation of that currently supported by Foundation grant PHY75-15986.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0019, NEUTRON DIFFRACTION CRYSTAL AND MOLECULAR STRUCTURE STUDIES

J.M. WILLIAMS, Argonne National Laboratory, *Argonne, Illinois* 60439 (CHE76-07409)

Neutron diffraction research is well established to be an invaluable tool for the elucidation of chemical structures. However, because of the large costs involved in such research (the need for large research reactors, highly sophisticated instrumentation, the need of large-scale computer software, etc.), the pursuit of neutron diffraction research in this country has generally been restricted to the very largest research laboratories, and in particular the national laboratories. The intent of this project is to broaden the scope of neutron diffraction studies in chemistry research. A mechanism is proposed whereby, for a relatively modest level of funding, the powerful tool of neutron diffraction can be made available to specific university researchers pursuing research in many new and important areas of chemical structure.

The project consists of eight research programs focusing on the unique advantages of neutron scattering for the location of 'light' atoms, frequently hydrogen and deuterium, and the precise description of thermal motion of these atoms in the presence of elements of high atomic number. These studies will generally emphasize investigations of the rather ubiquitous 'hydrogen-bond' which is all important in determining crystal-molecular architecture in many inorganic, organic and biological systems. Neutron diffraction is the only technique which can provide quantitatively meaningful answers to the question of the precise molecular geometry of the hydrogen bond and its chemical consequences in determining crystal and molecular structure.

SUPPORTED BY U.S. National Science Foundation, Div. of Chemistry

8.0020, DISORDERED SEMICONDUCTORS

H. FRITZSCHE, Univ. of Chicago, School of Physical Sciences, *Chicago, Illinois* 60637 (DMR77-11683)

The experimental program of research on the properties of defects and localized gap states in amorphous semiconductors previously supported by NSF grant DMR7515003 A01 will be continued. The role of valence alternation defects as luminescence or recombination centers will be studied by altering in a controlled manner their concentration by high-temperature doping and low-temperature drift diffusion of various addititves. Compensation of defects by the method of lithium drifting will be attempted in tetrahedrally coordinated semiconductors as well as in chalcogenide glasses. A new two-beam photoconductivity modulation technique using X-ray excitation together with infrared scanning will be employed to determine the energy distribution of recombination centers. Experiments will be performed to determine the nature of the reversible photostructural centers by means of photo-induced electron spin resonance and photo-induced infrared absorption.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0021, STUDY OF THE PHASE TRANSITION IN NIOBIUM DIOXIDE 14998-P

P.M. RACCAH, Univ. of Illinois, Graduate School, *Chicago, Illinois* 60680 (DA0F8978; DAAG29 77 G0084)

To study and elucidate the semi-conductor to metallic (SCM) transition by a study of this property in nbo sub 2. Relevance - devices made from these materials can be used as transient suppressors with minimal insertion loss. Specific military needs are for nuclear electromagnetic pulse (NEMP) transient protectors. The understanding of the SCM transition opens several new vistas in device fabrication--however good materials fabrication, characterization and modification is the first step in reaching these goals.

Stoichiometric niobium dioxide and Ti doped niobium dioxide crystals will be grown. Measurements will be made of the resistivity/temperature-magnetic susceptibility/temperature. In spectroscopy, several modulation reflectivity studies will be undertaken to elucidate lattice and electronic dynamics. Raman measurement will also be made to study the details of the modes of vibration of this material.

ADDENDA: Supporting agency address is: Darcom Research Office, Box 12211 Research Triangle Park NC 27709

SUPPORTED BY U.S. Dept. of Defense, Army

8.0022, A LOW-TEMPERATURE INVESTIGATION OF AMORPHOUS MATERIALS

A.C. ANDERSON, Univ. of Illinois, School of Liberal Arts & Sci., *Urbana, Illinois* 61801 (DMR77-08599)

This research was previously supported by DMR 75-09566.

The purpose of this research is to provide a consistent picture of the low-temperature thermal behavior of amorphous materials (glasses, plastics and glassy metals). The work will be directed toward the manipulation and identification of the localized excitations which are generally attributed to the reorientation of small groups of atoms through the mechanism of quantum mechanical tunneling. In particular, the energy dependence and densities of excitations will be studied by the use of ballistic phonon techniques and by noting the concomitant changes in specific heat, thermal conductivity, thermal expansion and other properties. Glassy metals will also be studied to determine the influence of localized excitation on the electronic properties of amorphous materials and to test current ideas of glass formation.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0023, PARITY NONCONSERVATION IN THE STRONG INTERACTION

H. FRAUENFELDER, Univ. of Illinois, School of Liberal Arts & Sci., *Urbana, Illinois* 61801 (PHY77-03311)

This research program will investigate the weak interaction between hadrons by measuring the helicity dependence of nucleon-nucleon scattering. A beam of longitudinally polarized protons is scattered from a low-Z target and the change in total cross section with helicity determined.

In collaboration with groups at Los Alamos and the University of Chicago, experiments are being performed at 15 MeV (Los Alamos) and 6 GeV (ANL) and are scheduled for 800 MeV (LAMPF). Since the parity-violating contributions are expected to be below 10 to the negative 6th power, relative accuracies of better than one part in 10 to the 7th power are required. To achieve this demanding goal, techniques have been developed to measure currents rather than individual particles. In the Van de Graaff experiments the helicity is changed at 1 KHz and the position,intensity and polarization of the beam are stabilized. Measurments at15 MeV with hydrogen, deuterium and helium targets have achieved statistical and systematic errors of less than 10 to the negative 7th power, and definitive values of pp, pd, and p4He helicity asymmetries are expected soon. From these results constraints on the possible form of the weak interaction between hadrons will be derived.

This work is a continuation of that currently supported under Foundation grant PHY73-04623 A02.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0024, DEFECT INTERACTIONS IN CRYSTALS

A.V. GRANATO, Univ. of Illinois, School of Liberal Arts & Sci., *Urbana, Illinois* 61801 (DMR77-10556)

This research was previously supported under DMR 75-14726.

The main focus of this research is the investigation of dislocation - point defect interactions and the influence on these interactions of electrons, phonons and optical illumination. Ultrasonic attenuation will be studied in a variety of crystals in order to measure the nature of these interactions. Among the systems which will be investigated are (1) carbon in iron, (2) free interstitials in metals, (3) defects in irradiated metals and (4) impurity-interstitial complexes. The strength loss of superconductors and the strength increase of II-II compounds under optical illumination will be studied by means of ultrasonic measurements.

The development of theories to explain these effects will be continued. In particular, this will include the theory of long-range dislocation - point defect interactions and the effect of thermal fluctuations on amplitude-dependent internal friction.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0025, VERY THIN SUPERFLUID HELIUM FILMS
J.M. MOCHEL, Univ. of Illinois, School of Liberal Arts & Sci., *Urbana, Illinois* 61801 (DMR72-03291 A03)

Previously supported by NSF Grant DMR72-03291, research on the study of superfluid helium films will be continued. The thermal excitations in thin 4He films which form a thermodynamically two-dimensional system have enabled the investigator to overcome difficulties involved in making high-precision third sound and pressure measurements on this system. Studies of the effects of quantum statistics in two dimensions and the nature of the helium film and its surface will be undertaken. One of the simplest systems of adsorption, helium on rare gas crystals, and under conditions of extreme purity, even of 4He from 3He will be investigated. Major aims of this proposed research program are an understanding of the basic physics of Van der Waals adsorption, two-dimensional superfluidity, 3He surface states, and thermal boundary resistance between two-dimensional and three-dimensional excitation systems.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0026, SOME PHYSICAL AND CHEMICAL PROPERTIES OF MOLECULES, ATOMS AND NUCLEI BY USE OF ELECTRON IMPACT SPECTROSCOPY
R.A. BONHAM, Indiana University, School of Arts & Sciences, *Bloomington, Indiana* 47401 (CHE76-83683)

Dr. Bonham intends to continue and expand a program of research, currently supported by Foundation grant CHE-7403463, dealing with the fields of high-energy electron impact spectroscopy and pulsed electron beam time-of-flight spectroscopy. These experimental techniques involve investigating the electronic structures of molecules and atoms using electrons in the incident kinetic energy range of 0.5 eV to 60 keV as the probe projectiles. Scattered or ejected electrons produced by such probe-target collisions will be detected and their kinetic energies analyzed as a function of their deflection or emission angles relative to the incident probe direction. The main observed quantity in such experiments is the scattered or ejected electron intensity (cross section) which is measured as a function of the detected electron kinetic energy, and the scattered or ejected direction (angle) relative to the incident probe direction and the probe direction and the probe kinetic energy.

SUPPORTED BY U.S. National Science Foundation, Div. of Chemistry

8.0027, FUNDAMENTAL PROCESSES IN CONDENSED MATTER
W.L. SCHAICH, Indiana University, School of Arts & Sciences, *Bloomington, Indiana* 47401 (DMR76-20034)

Research continues on the theoretical study of fundamental processes in condensed matter. Two specific areas are investigated. First, work continues on the Brownian motion model of surface reaction dynamics, aiming at more sophisticated calculations of the relevant parameters. Possible reasons for the failure of the Lifshitz theory of dispersion forces to explain recent atom-cylinder scattering experiments also will be examined. Second, the Principal Investigator is extending his theory of the driving forces of electromigration to clarify questions of principle and to make it fully quantitative. It will be applied to problems of anisotropy and isotope effects.

This is a continuation of research supported under DMR74-14063.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0028, ATOMIC EMISSION SPECTROSCOPY
K.L. ANDREW, Purdue University, School of Science, *Lafayette, Indiana* 47907 (PHY77-02087)

Theoretical and experimental investigations of relatively simple spectra, are selected to shed the most light on the relationship between Slater-Condon theory and experimental data. Fourier spectroscopic techniques developed originally for molecules are being applied to atomic spectra.

This work is a continuation of that currently supported under NSF grant Number PHY75-09066A01.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0029, COLLECTIVE PHENOMENA AND ASSOCIATED PARTICLE-CORE COUPLING IN MASS-100 NUCLEI
P.C. SIMMS, Purdue University, School of Science, *Lafayette, Indiana* 47907 (PHY77-12610)

This program combines experiment and theory to study the structure of transitional nuclei with roughly 100 nucleons. Excitation energies and gamma-ray decay properties of high spin states excited in heavy ion induced evaporation reactions are determined using coincidence techniques, as well as the Doppler shift alteration method. Theoretical predictions based on the interaction of one, two, or three quasiparticles with slightly deformed rotating cores are reasonably consistent with data at hand on isotopes of palladium, cadmium, and silver. Further experimental work is planned on selected nuclei in this mass region. Refined theoretical work will be done which includes effects due to the variable moments of inertia of the core, as well as ellipsoidal deformations of the core.

This work is a continuation of work supported by grant PHY73-04914 A02.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0030, NUCLEUS - NUCLEUS INTERACTIONS AT HIGH ENERGIES
W.V. JONES, Louisiana State Univ. Systems, Graduate School, *Baton Rouge, Louisiana* 70803 (PHY77-01083)

A study of heavy nuclei interacting in nuclear emulsion is in progress. Data already exist in emulsions which were exposed to cosmic radiation in a balloon flight at a latitude corresponding to a geomagnetic cut-off of 1.5 GeV/nucleon. A second exposure to a beam of iron nuclei, 2.1 GeV/nucleon, is planned. The combination of the two exposures will enable measurements of nucleus - nucleus interaction events over a continuous range of energies up to 80 GeV/nucleon.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0031, THE DYNAMICS OF SUPERFLUID FLOW IN BOTH BULK AND FILMS
R.B. HALLOCK, Univ. of Massachusetts, School of Arts & Sciences, *Amherst, Massachusetts* 01002 (DMR76-08260 A01)

Work started under NSF Grant DMR75-08630 will continue and is concerned with the dynamical properties of superfluid 4He as evidenced in saturated superfluid films and bulk superfluid flow through apertures and channels. Film flow experiments will be carried out to investigate (1) the attenuation of third sound in thick films, (2) the phase relationships between temperature and amplitude variations in third sound, (3) critical velocities and dissipation at high flow velocities in saturated films. A possibly definitive experiment will be carried out to study film thinning

under flow conditions, and previous studies of the damping of Atkins oscillations will be extended down to 0.3K. Also to be conducted are bulk flow experiments to (1) search for velocity dependent turbulence downstream from an aperture, (2) study flow through a systematically selected series of apertures and channels, (3) reproduce and try to understand the Trela-Fairbank anomaly in two reservoir oscillations and (4) continue to work toward an experiment to measure the energy needed to create a single vortex ring by flow through an aperture.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0032, MATHEMATICAL PHYSICS
A.M. JAFFE, Harvard University, School of Arts & Sciences, *Cambridge, Massachusetts* 02138 (PHY77-18762)

This work represents a continuation of that currently supported by Foundation grant PHY75-21212 A01. The effort to close the gap between the mathematical and physical frontiers of quantum field theory and statistical mechanics will continue, as will the investigation of gauge fields, phase transitions, quark trapping and instantons in both lattice and continuum gauge field theories. It is planned to pursue an understanding of the geometric aspects of gauge fields and to develop estimates and expansion methods for quantitative study of these problems. It is also planned to investigate dipole gases and their long-range correlations in behavior, and to continue the investigation of the mathematical connections between field theory and statistical mechanics.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0033, SPECTROSCOPIC DETERMINATION OF INTERMOLECULAR POTENTIALS OF GAS LASER COMPONENTS AND OF MAJOR ATMOSPHERIC CONSTITUENTS
W. KLEMPERER, Harvard University, School of Arts & Sciences, *Cambridge, Massachusetts* 02138 (DF048100; AFAFOSR-3269-77)

AF function - communications, surveillance, detection systems, weaponry for airborne applications. Deficiency - the characterization of collisional processes leading to the excitation and deactivation of internal degrees of freedom in laser and atmospheric molecules is incompletely established. Objective - this research program is concerned with the determination of intermolecular pair potentials by the measurement of the rotational spectra of loosely bound complexes. How work contributes - a detailed knowledge of the intermolecular potential of laser gases such as Hf with a variety of molecules should be of value in obtaining a fundamental understanding of the collisional behavior of Hf. This provides an understanding of its vibrational relaxation to facilitate laser design.

The spectroscopy of the complexes uses molecular beam sources with supersonic nozzles for their preparation and mass spectrometers for species identification. The spectroscopy involves rotational transitions for a fized vibrational state which provides properties of the intermolecular potential in the region of classically allowed motion. The determination of the intermolecular potential for a system from the observed data involves solution of the Schroedinger equation for the weak bond degrees of freedom. A parameterized potential is introduced, the Schroedinger equation solved, and parameters are adjusted to produce the best agreement with spectroscopic constants.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NC Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

8.0034, EXPERIMENTS ON THE NUCLEON-NUCLEON FORCE, PARTICULARLY PARITY VIOLATION
R. WILSON, Harvard University, School of Arts & Sciences, *Cambridge, Massachusetts* 02138 (PHY77-11115)

A major goal of this research is to establish the size of parity violation in nuclear processes. The gamma rays following neutron-proton capture will be studied for (1) asymmetric yields induced by polarized neutrons and (2) circular polarization induced by unpolarized neutrons. Similar experiments on heavier targets will reveal the extent of parity violations in heavy nuclei. Other work will be done on the nature of the strong nucleon-nucleon force.

This is a continuation of work supported under NSF grant PHY72-05122 A03.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0035, DEVELOPMENT OF A ONE-METER-SCALE FORCED-FLOW COOLED TEST COIL USING MULTIFILAMENTARY NIOBIUM-TIN SUPERCONDUCTOR
D.B. MONTGOMERY, Mass. Inst. of Technology, Francis Bitter Natl. Mag. Lab., *Cambridge, Massachusetts* 02139 (EG-77-S-02-4182)

The purpose of the program is the development of cabled, forced-flow helium-cooled superconductors, based on multifilamentary niobium-tin materials, able to generate and function under conditions of high magnetic field and high current density, typical of requirements for a forced cooled tokomak toroidal magnet. In the current Phase I of the program we are to fabricate test coils, using conductors made from industrially available superconducting wires, which will be activated post fabrication. Phase II is reserved for the development of superior combinations of materials while Phase III has been designed for the demonstration of a one- or two-meter-scale tokomak-type racetrack test coils. In all three phases test coils will be subject to DC as well as AC stability tests designed to evaluate their limits of performance. Facilities at this, the Francis Butler National Magnet Laboratory, will be used for all experiments.

RESULTS: Sources of basic superconducting material have been investigated. Vendors have been selected subject to contracting office approval.

SUPPORTED BY U.S. Energy Research & Development Admin., Div. of Magnetic Fusion Energy

8.0036, HIGH-ALTITUDE PLASMA ANALYSIS
B.F. SELLERS, Panametrics Incorporated, *Waltham, Massachusetts* 02154 (DF249030; F19628-77-C-0137)

AF function - communications and reconnaissance. Deficiency -anomalous behavior of high-aititude satellites. Research - calibrate, integrate and evaluate instrumentation to measure electron and proton fluxes in .05 - 500 keV energy range. How research contributes - this analysis will be of an instrument used in the SCATHA satellite as one of a number of sensors intended to define the particle and field environment at synchronous orbit and its effect on satellite performance. It involves the integration, calibration and testing of SCATHA satellite instruments, the in-orbit operation, and the evaluation and analysis of research data from this instrument. These data will further the understanding of the synchronous orbit plasma and the causes of spacecraft charging.

This contract will provide for the integration, calibration, evaluation, and data analysis of a high-time-resolution particle spectrometer aboard the SCATHA satellite. By defining on a rapid time basis the influx of energetic plasma to the SCATHA satellite, the build-up of potential and charge aboard a synchronous orbit satellite will be better understood. The in-orbit operation of the experiment, in coordination with other SCATHA instruments, will relate cause and effect in spacecraft charging and help to provide design criteria so that future space systems will be resistant to spacecraft charging.

ADDENDA: Supporting agency address is: AF Geophysics Laboratory PH Hanscom AFB, Bedford, Mass 01730

SUPPORTED BY U.S. Dept. of Defense, Air Force

8.0037, APPLICATIONS OF FUNCTIONAL ANALYSIS IN ELEMENTARY PARTICLE PHYSICS AND STATISTICAL MECHANICS
P. FEDERBUSH, Univ. of Michigan, School of Lit. Sci. & The Arts, *Ann Arbor, Michigan* 48104 (PHY77-02187)

The investigator will continue a program of research involving rigorous applications of functional analysis in the quantum field theory of elementary particles, scattering theory and statistical mechanics. The major areas to be studied are: the exploitation of a constructive-field-theory-like cluster expansion in statistical mechanics, Euclidean field theory methods for fermions, and other related applications in statistical mechanics including correlation inequalities. This work is a continuation of that supported by Foundation grant PHY75-10751 A01.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0038, THEORETICAL STUDIES IN SOLID-STATE PHYSICS
T.A. KAPLAN, Michigan State University, School of Natural Sciences, *East Lansing, Michigan* 48824 (DMR76-16597)

This project supports a variety of topics in theoretical solid-state physics. It includes studies in the following areas: phase transitions involving mixed configurations in samarium compounds; excitations in rare-earth semiconductors involving localized holes; structural, magnetic, and optical properties of alkali superoxides; thermal single determinant approximation; study of one-electron states for strongly correlated narrow-band electrons; band theory and exchange interactions in semi-conductors and insulators.

Reference: DMR72-03149 A02.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0039, DYNAMIC NUCLEAR POLARIZATION INVESTIGATIONS OF SOLIDS
S. LEE, St. Louis University, Graduate School, *St. Louis, Missouri* 63103 (DMR77-08467)

The magnetic resonance research program supported by DMR73-07633 will be continued. This research program includes: (1) investigations of unusual nuclear magnetic resonance (NMR) enhancement behavior of dynamic nuclear polarization (DNP) of the Solid Effect associated with electron spin resonance (ESR) systems involved with large crystal-field, fine-structure splitting; (2) DNP investigations of the correlated ESR and NMR strain-broadening effect in single crystals; (3) investigations of the ESR and NMR line-broadenings arising from the c-axis variation effect by DNP in single crystals; (4) studies of uniaxial stress on ESR and NMR systems in single crystals by DNP; (5) DNP investigations of structural properties and nuclear spin diffusion processes in nonsingle crytalline solids; (6) investigations of ESR properties of rare-earth S-state ions in alkaline earth fluoride crystals.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0040, ALIGNMENT AND ORIENTATION IN ATOMIC COLLISIONS
J. MACEK, Univ. of Nebraska, School of Arts & Sciences, *Lincoln, Nebraska* 68508 (PHY77-07110)

Research initiated under NSF grant PHY75-07805 AO1 will be continued. Topics in theoretical atomic physics to be investigated include: 1. Spin polarization of hydrogen in H ion plus Xe collisions. 2. Coulomb-Born approximation. 3. Analysis of He ion plus He collisions and the Fano-Lichten model. 4. Orientation and alignment of the molecular orbital X-ray source. 5. Doubly excited state of helium. 6. Conversion of alignment and orientation in strong magnetic fields.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0041, THEORY OF PHASE TRANSITIONS AND SUPERFLUIDS
M.J. STEPHEN, Rutgers The State University, School of Arts & Sciences, *New Brunswick, New Jersey* 08903 (DMR75-13350 A03)

The research program supported by NSF Grant GH-38458 (DMR-7307598) will be continued. The work utilizing the graphical method to determine the logarithmic corrections to the mean field theory of critical points will be extended to consider unsymmetrical tricritical points and the Potts model. The investigation of roton excitations in liquid 3He 4He mixtures will be extended to obtain a better numerical value for the 3He roton energy. The considerations of the Raman scattering from rare-gas liquids and solids will emphasize the low-frequency shift and the details of the coupling between light and excitations in helium. The program on the transport properties in biological solutions will be extended to more realistic situations. Interactions with various experimental programs will remain strong.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0042, SPUTTERED MERCURY-CADMIUM TELLURIDE MATERIAL FOR INFRARED DETECTORS
R.H. CORNELY, New Jersey Inst. of Technology, School of Engineering, *Newark, New Jersey* 07102 (DF047800; AF-AFOSR-3249-77)

AF function - aerospace communications, surveillance and detection systems require electrooptical devices which exploit the special properties and interactions of infrared radiation with solid-state materials. Opportunity - materials sensitive in the far infrared region of the electromagnetic spectrum have a high impact on novel devices for airborne and satellite applications. Objective - the aim of this research is to deposit and examine single crystals of HgCdTe by radio-frequency, triode sputtering techniques, and to establish the dependence of material parameters such as band gap, carrier concentration and mobility, chemical composition and film stoichiometry upon deposition parameters such as hg sputtering gas pressure, film deposition rate, and substrate material, temperature, r.f. bias and presputtering surface treatment. How work contributes - sophisticated electro optical techniques in narrow band-gap compound semiconductors offer promise for electrooptical microcircuitry and for wide-angled infrared sensing in the 3-5, 8-14, and 18-25 micrometer spectral regions.

Obtain a detailed understanding of the conductive, optical and compositional properties of sputtered HgCdTe films by measuring Hall-effect and optical transmissivity and by utilizing Auger spectroscopy, electron and X-ray diffraction methods, and chemical analysis techniques. Explore the methods of forming p and n-type regions, by hg vapor changes or simultaneous sputtering of dopants. Study trapping and noise phenomena in sputtered films using field-effect measurements.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NE Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

8.0043, THEORETICAL PHYSICS
J.N. BAHCALL, Inst. for Adv. Study, *Princeton, New Jersey* 08540 (PHY77-20612)

This work represents a continuation of that currently supported by Foundation grant PHY75-16298 A01. The Institute will maintain its program of inviting a large number of theoreticians to spend a year or more with the resident Faculty, thus providing a valuable research experience for young post-doctorals and a stimulating environment for some senior physicists on sabbatical leave. The areas of theoretical physics to be investigated area: field theory, astrophysics, statistical mechanics and mathematical physics. Illustrative topics are: statistical analyses of astronomical data; astrophysical studies using plasma physics; quantum chromodynamics.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0044, THEORETICAL SOLID-STATE PHYSICS - OPTICS, AND GROUP THEORY APPLICATIONS
J.L. BIRMAN, City University of New York, School of Arts & Sciences, *New York, New York* 10031 (DMR76-20641)

Research started under grant DMR74-21991 will be generalized and extended. Further application of group-theoretical methods to condensed matter physics will be made. In particular, application to structural distortions in A15 compounds and a study of the compatibility of superconductivity and ferroelectricity will be undertaken. Further work on a theory of amorphous tetrahedral compounds will also be done.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0045, PREDICTION OF TC PHASE STABILITY OF SUPERCONDUCTING COMPOUNDS
E.S. MACHLIN, Columbia University, School of Engineering, *New York, New York* 10027 (DMR77-08667)

This is a continuation of a study on the effect of alloying elements on the phase stability of the stoichiometric A15 structure for binary and pseudo-binary systems of superconducting interest, which are unstable at stoichiometric composition. The pair potential model is used to develop equations for the energy as a function of composition and order. The free energy functions are employed to determine whether the application of pressure can stabilize the temperature range over which the stoichiometric composition is stable, and to determine which ternary alloying additions and how much is necessary to stabilize the A15 structures in potentially high Tc superconducting systems. To date, a correlation has been found between Tc and the minimum force constant for oscillation of an atom on a chain site with respect to its stationary nearest atoms, in the family of crystal structures containing such continuous chains of atoms but which are not in close packed planes. During the renewal period, this correlation will serve as a design procedure to identify candidate super-high Tc materials. In addition, similar correlations will be sought having potential for prediction of Tc for other families of structures characterized by electron coupling to a unique phonon mode. The ionicity modified pair potential model will be used to characterize the defects likely to affect Tc in the A15 and homologous structures, and to develop pair potential models for the Nb5Ge3 structures. These models will be used to ascertain how to bias the relative stability in favor of the A15 structure in the Nb-Ge system. This is a renewal of NSF DMR74-22493.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0046, CONSTRUCTION OF AN ATOMIC BEAMS APPARATUS
B. BEDERSON, New York University, School of Arts & Sciences, *New York, New York* 10012 (PHY76-82434)

This grant will supply funds for the construction of a new atomic beams apparatus, which will make possible new atomic collision experiments of fundamental nature which have hitherto been only marginally feasible, or not feasible at all. The atomic beam recoil technique will be used in order to study electron-atom collisions and obtain absolute cross sections for state-selected reactions.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0047, GAUGE THEORIES AND HADRON PHYSICS
L. SUSSKIND, Yeshiva University, School of Science, *New York, New York* 10033 (PHY76-16992 A01)

Research will be done in a number of elementary particle dynamics and quantum field theory. These areas include: lattice gauge theory, hadron jets, and instantons. The purpose of the work is to explore both model and realistic field theories with the intent of better understanding the quark structure of hadrons and the behavior of hadronic processes.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0048, MOLECULAR BEAM AND LASER-INDUCED FLUORESCENCE SPECTROSCOPY OF SMALL MOLECULES
J.S. MUENTER, Univ. of Rochester, School of Arts & Sciences, *Rochester, New York* 14627 (CHE77-12527)

Using the techniques of molecular beam electric resonance spectroscopy and laser-induced fluorescence spectroscopy, Prof. Muenter will study electronic properties of a variety of small molecules. The molecular beam methods will be used to accurately measure dipole moments, polarizabilities, and nuclear hyperfine parameters of the ground electronic state of molecules. The molecules which will be studied have been chosen because of unusual chemical characteristics and in general contain fluorine, chlorine, and/or nitrogen atoms. A major goal in these studies will be obtaining information which better defines the intermolecular interactions of the molecules in question.

The laser-induced fluorescence experiments will be directed toward extending high-resolution measurements, which have been routine for the electronic ground state of molecules, to excited electronic states. Wavelength tunable dye lasers will be used to excite molecules to upper electronic levels where radio frequency and microwave transitions will be studied. The high-resolution transitions will be detected by observing the excited electronic state fluorescence. The molecular properties obtained in these experiments will provide important parameters which characterize photochemically active molecules. This research represents a continuation of that currently supported by Foundation grant CHE-7412250.

SUPPORTED BY U.S. National Science Foundation, Div. of Chemistry

8.0049, GROWTH AMD PROPERTIES OF INP
J.K. KENNEDY, U.S. Air Force, Rome Air Development Ctr., *Rome, New York* 13442 (DF902880)

AF function - integrated optics and signal processing. Deficiency - materials deficiencies in integrated optics and signal processing devices. Objective - to determine the preparation and growth parameters necessary to produce high-quality bulk single crystals of InP and other III-V's for use as substrates for device fabrication. How research contributes - indium phosphide has great potential for the Air Force as a substrate material both for integrated optical communication systems and signal processing systems. The potentials of test devices have already been demonstrated; however, the high cost, poor quality and lack of reproducibility and reliability of the indium phosphide substrates is a major roadblock to the successful exploitation of this material.

Most of the commercially available indium phosphide single crystals are grown in Great Britain although one domestic vendor started supplying in limited quantities earlier this year. The cost of this material is very high and the quality varies appreciably from batch to batch. To supply our in-house device fabrication needs we intend: (1) to investigate and develop a synthesis procedure for the preparation of high-quality polycrystalline indium phosphide; (2) to use the polycrystalline indium phosphide prepared in (1) to grow high-quality undoped, n-type p-type, and semi-insulating indium phosphide single crystals using the liquid encapsulation technique.

ADDENDA: Supporting agency address is: Rome Air Development Center ETS, Griffiss AFB, N Y 13440

SUPPORTED BY U.S. Dept. of Defense, Air Force

8.0050, PHYSICAL PROPERTIES OF NARROW SUPERCONDUCTING FILMS AND ARRAYS
Y. KAO, State University of New York, School of Arts & Sciences, *Stony Brook, New York* 11790 (DMR77-04511)

This research is a continuation of work begun under NSF grant No. DMR73-07494. The properties of superconducting microbridges, Josephson junctions and arrays of Josephson junctions will be studied in order to develop sensitive radiation detectors. Computer-controlled electron-beam lithography will be used to fabricate superconducting microbridges which range in size from a few thousand Angstroms to a few microns. The physical properties of individual bridges will be studied and a special emphasis will be placed on the coupling between adjacent bridges. Measurements will be made to study non-equilibrium ef-

fects and the dynamics of superconducting pairs in arrays of Josephson junctions. A primary goal of the research is to understand the coherent properties of arrays of weakly coupled superconductors.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0051, EXPERIMENTAL HADRON AND LEPTON RESEARCH USING SPECTROMETER AND BUBBLE CHAMBER TECHNIQUES
J. LEEFRANZINI, State University of New York, School of Arts & Sciences, *Stony Brook, New York* 11790 (PHY76-22154 A01)

A diverse program of research will be conducted at Fermilab and Brookhaven in collaborative experiments with several university user groups. The program includes the following: 1. Search for the decay micron plus yields positron plus gamma. 2. Study of neutrino deuterium interactions in the 15 foot bubble chamber. 3. Search for associated charm particle production using the Multi-Particle Spectrometer. 4. Analysis of pp interactions at a few hundred GeV using the 30 inch hybrid bubble chamber system. 5. Study of high-mass lepton and hadronic pairs in high-energy pp collisions. Knowledge about many aspects of weak interactions as well as strong interaction dynamics is indicated.

This work represents continuation of that currently supported by Foundation grant PHY76-22154.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0052, THERMOELECTRIC EFFECTS IN METALS AND ALLOYS
P.L. TAYLOR, Case Western Reserve Univ., Graduate School, *Cleveland, Ohio* 44106 (DMR76-02368)

The effects due to impurity ion recoil and two-phonon processes will be incorporated into a theory of thermoelectricity in metals and alloys at low temperatures. A highly simplified initial approach using the Boltzmann equation and a model of free electrons will be extended to include anisotropy and Umklapp scattering. A more basic approach using the Kubo formalism instead of the Boltzmann equation will be undertaken as well.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0053, RAPID X-RAY METHOD FOR QUALITY CONTROL OF CRYSTALLINE LASER MATERIALS
F. WITT, U.S. Army, Pitman Dunn Research Labs., *Philadelphia, Pennsylvania* 19137 (DA0B0629)

To determine the experimental conditions necessary to obtain high-quality pseudo-Kossel X-ray patterns. To interpret such patterns in terms of the defect nature of the laser material and to perform preliminary analyses of the principal strains and principal directions in 'as grown' material.

A very fast and highly successful high-resolution X-ray method has been developed in-house and is described in the report numbered FA-M72-20-1. The method is capable of detecting substructure variations in the submicron range caused by dislocation networks. It has the potential to reveal the existence of crystal inhomogeneities (such as dopant concentration gradients, impurities, inclusions, precipitates, and thermal strains) introduced by the Czochralski or the top-seeded solution cyrstal growing techniques.

ADDENDA: Supporting agency address is: ARRADCOM Pitman Dunn Research Labs, Frankford Arsenal, Philadelphia PA 19137

SUPPORTED BY U.S. Dept. of Defense, Army

8.0054, PHOTOEMISSION STUDIES OF SURFACE USING SYNCHROTRON RADIATION
T. GUSTAFSSON, Univ. of Pennsylvania, School of Arts & Sciences, *Philadelphia, Pennsylvania* 19104 (DMR76-03015 A01)

A general-purpose surface study system will be constructed at the Physical Sciences Laboratory in Stoughton, Wisconsin. This system will primarily be designed to use the synchrotron radiation at Stoughton for angle and energy resolved photoemission. It will also contain facilities for low-energy electron diffraction, ion bombardment, flash desorption, etc., for in situ preparation and characterization of the surface under study. Once in operation, this system will be available to qualified users. Also, experiments will be carried out using this instrumentation to study the angular resolved photoemission from clean surfaces of nickel and tungsten as well as surfaces with chemisorbed gas molecules.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0055, THERMODYNAMICS AND STATISTICAL MECHANICS OF PHASE TRANSITIONS
R.B. GRIFFITHS, Carnegie Mellon University, Mellon Institute of Science, *Pittsburgh, Pennsylvania* 15213 (DMR76-23071)

Research in the thermodynamics and statistical mechanics of phase transitions, previously supported under NSF grant DMR73-02419 A01, will be continued. The proposed research will be concerned with phase transitions and critical points in liquid mixtures; higher order critical points in liquid mixtures; an experimental search for a special tricritical point in a five-component mixture; the theory of phase transitions in gases adsorbed on a graphite substrate; and some renormalization-group calculations associated with these problems. Experiments concerned with the dynamics of nucleation in metastable liquids near their critical points will also be performed.

This is the first year of a 2-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0056, EXCITED STATES OF HYPERONS
E.J. ENGELS, Univ. of Pittsburgh, School of Arts & Sciences, *Pittsburgh, Pennsylvania* 15260 (PHY77-07205)

Analysis of data from two experiments conducted at major high-energy physics installations in this country will be performed. The experiments are the following: 1. Semi-leptonic decays of the negative triple bond. This experiment, performed in collaboration with a group from Brookhaven National Laboratory, has as its goal the furthering of the properties of the weak interactions. The reactions of interest include: Negative triple bond yields lambda plus electron plus nu; Negative triple bond yiels neutral sigma particle plus electron plus nu. In addition, the reaction negative sigma yields lambda particle plus electron plus nu will also be studied. 2. Measurements of Pion and Kaon form factors: This experiment attempts to measure the effective sizes of the pi and K mesons by the determination of their form factors through pi - e and K - e scattering at high energies. The experiment, performed at Fermilab, is a collaborative one with groups from Notre Dame, UCLA, Fermilab and the Soviet Union. This work is a continuation of that begun under NSF Grant PHY72-04856 AO4.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0057, TRANSIENT NUCLEAR MAGNETIC RESONANCE STUDY OF SOLIDS
I.J.LOWE, Univ. of Pittsburgh, School of Arts & Sciences, *Pittsburgh, Pennsylvania* 15260 (DMR76-22655 A01)

Research carried out under grant DMR72-02983 will be continued. Four different experiments and calculations for nuclear magnetic resonance in solids are proposed. (a) A continuation of the development of the zero time resolution (ZTR) experiments in solids and the techniques for extracting useful information from the free induction decay (FID). (b) The fluorine in lead fluorine doped with KF and NaF has a very high mobility. Measurements will be continued on PbF2 to (1) identify the T1 mechanism which we have shown is not due to fluorine motion. (2) Find out why the activation energy for fluorine motion, as measured by nmr, differs from the various activation energies that are measured by ionic conductivity. (c) A continuation of the nmr measurements of high-pressure ices will be made. (d) Attempts to measure the rate of diffusion of hydrogen in the intermetallic hydride LaNi5H6.7 will be continued.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0058, EXPERIMENTAL HEAT CAPACITY STUDIES OF HEAVY NOBLE GAS ATOMS ADSORBED ON EXFOLIATED GRAPHITE

G.A. STEWART, Univ. of Pittsburgh, School of Arts & Sciences, *Pittsburgh, Pennsylvania* 15260 (DMR75-06793 A01)

Experimental heat capacity studies will be made to examine the thermal and phase equilibrium properties of heavy noble gases adsorbed on the basal plane surface of exfoliated graphite. These experiments will detail the two-dimensional phase diagrams for argon, krypton, and xenon. Studies for krypton and xenon utilizing vapor pressure techniques have suggested that a variety of phases exist on exfoliated graphite including regions in the coverage-temperature plane corresponding to dimensional solids, liquids, gases, and phase coexistence. The heat capacity experiments will be used to locate precisely anticipated triple points, critical points, and phase boundaries. The effects of substrate and dimensionality will be examined through the dependence of the heat capacity on temperature and areal density. There are presently no heat capacity measurements for heavy atom monolayers on exfoliated graphite.

Heat capacity will also be used to locate and examine a disordering transition in the two-dimensional solid phase near monolayer coverage. The existence of this transformation has been suggested through direct observation of xenon and nitrogen heavy atom systems. The transition appears to be a registry-misregistry effect at a coverage such that 1/3 of the carbon hexagons of the underlying graphite basal plane are occupied by adsorbate atoms. A vapor pressure study using krypton is also suggestive with regard to the existence of a heavy atom transition at this coverage, and critical behavior was observed in light atom helium heat capacities on graphite at 1/3 hexagon coverage. The helium results have been identified with a lattice gas-disorder transition, but no thermal information exists for the heavy atom systems where disordering has been directly observed.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0059, THEORETICAL INVESTIGATIONS IN HIGH-ENERGY AND ELEMENTARY PARTICLE PHYSICS

R.S. WILLEY, Univ. of Pittsburgh, School of Arts & Sciences, *Pittsburgh, Pennsylvania* 15260 (PHY77-08287)

This work represents a continuation of that currently supported by Foundation grant PHY75-14073 A01. Research will be done in six general areas. (1) Precision tests of QED (high order calculation of electron g-2). (2) Gauge theories (classical gauge theories, infrared problem, etc.). (3) Hadronic wave functions (quark models and parton models). (4) Chiral models (calculations of meson spectroscopy and phase shifts, relation to quark model). (5) Regge phenomenology (detailed fit to high-energy data, applications of Reggeon field theory). (6) Duality (relation to other composite particle models).

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0060, IONS IN CRYOGENIC HELIUM

J.A. NORTHBY, Univ. of Rhode Island, School of Arts & Sciences, *Wakefield, Rhode Island* 02881 (DMR76-11111 A01)

This work will extend present studies initiated under NSF grant DMR74-07661/A01 of the behavior of charged particles in low-temperature helium in two separate areas. The first of these is a study of vortex dynamics in turbulent superfluid helium which utilizes the ion-vortex interaction. Information about the growth, motion, and decay of vorticity is obtained by studying how ions are trapped, dragged about, and released. Measurements of counterflow will be improved, and then the techniques will be extended to study turbulence in pure superflow. At the same time temperature gradients in both turbulent counterflow and superflow, in wide channels will be measured. The second study concerns the liquid droplet which is expected to form about a positive ion in cryogenic helium vapor. By measuring the ion mobility as a function of temperature and density one should be able to demonstrate the existence of these ion-droplets and to obtain a measure of their size and rate of formation. If they can be shown to form quickly enough over a significant range of temperature and density they will provide an interesting and valuable system for further study.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0061, RESEARCH PROGRAM IN ELEMENTARY PARTICLE THEORY

E.C. SUDARSHAN, Univ. of Texas, School of Natural Sciences, *Austin, Texas* 78712 (EY-76-S-05-3992)

The proposed research in the structure of matter is part of a long-range program investigating our understanding of matter in terms of both currently available phenomena and on the basis of more fundamental questions concerning the methodology of microscopic physics. Several of the staff are proposing to study extended model pictures of hadrons such as strings or bags and apply them to high-energy data. Others are investigating the concept of Quantum Measurement Theory and examining the possibility of observing anomalous long or short time behavior. An ongoing program in mathematical physics concerning both quantum mechanics and the algebraic structure of currents is being continued. A program on particle physics applications to astrophysics has matured to the point at which many observable phenomena at either high density or high temperature are being predicted. The exciting new area of research in supersymmetric theories of particle physics and the development of supersymmetric theories of gravity were pioneered by staff at the Center. They propose to continue those investigations and possibly begin the development of a unified field theory of matter. All of these inputs combine to produce a coherent and broadly based investigation into the fundamental structure of matter.

SUPPORTED BY U.S. Energy Research & Development Admin., Div. of High Energy & Nuclear Physics

8.0062, GAS-SOLID INTERACTIONS AT SEMICONDUCTOR SURFACES

J.H. LUNSFORD, Texas A & M University System, School of Science, *College Station, Texas* 77843 (CHE75-15456 A02)

Electron paramagnetic resonance (EPR) spectroscopy has been used to identify the ions O minus, O minus sub 2, and O minus sub 3 on the surface of certain metal oxides; yet, the role of these ions in partial and complete catalytic oxidation has not yet been established. Detailed observation will be made to determine the reactions which occur between these ions and representative hydrocarbons. Surface intermediates will be identified where possible. Both the product distribution and reaction rates will be determined. This work will include a study of the ozonide ion with respect to its role in photocatalytic oxidation reactions. As a model of a truly catalytic system molybdenum oxide supported on silica gel will continue to be investigated for oxidation and oxidative dehydrogenation reactions. The relative differences in reactivity and selectivity between surface O minus, O minus sub 2, and O minus sub 3 ions will be determined. Photoelectron spectroscopy will be applied to identify oxygen species on metal oxide surfaces. This work should provide a model for understanding the general problem of catalytic oxidation reactions. This work is a continuation of that currently supported by Foundation grant GP-35662X.

SUPPORTED BY U.S. National Science Foundation, Div. of Chemistry

8.0063, EXPERIMENTAL STUDIES OF SUPERCONDUCTIVITY IN AMORPHOUS METALS

D.G. NAUGLE, Texas A & M University System, School of Science, *College Station, Texas* 77843 (DMR75-04364 A01)

Research begun under NSF grant No. DMR75-04364 will be continued and extended. Three related problems will be studied in this research. The thermodynamic properties of amorphous transition metals will be investigated with special emphasis on those materials which are superconducting. Measurements in-

clude both specific heat and transport measurements. In the second area of research the proximity effect at superconductor-normal metal boundaries will be studied using kinetic inductance measurements in order to determine the spatial average of the order parameter across the sample. In addition, ac specific heat measurements will be made on the same proximity effect films. In the third area of research, the electromagnetic properties of strong-coupling amorphous superconductors will be investigated by low-frequency conductivity measurements.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0064, INVESTIGATION OF NUCLEAR MOLECULES
D.H. YOUNGBLOOD, Texas A & M University System, School of Science, *College Station, Texas* 77843 (A-558)

Fragments of the quadrupole giant resonances (a molecular-like quadrupole shape oscillation), located in heavier nuclei utilizing inelastic scattering of alpha particles, have now been located in 24Mg, 27Al and 28Si. In contrast to the heavier nuclei this E2 strength is fragmented and contains only about 30% of the strength found in heavier nuclei. This can be understood qualitatively by realizing that the collective features which dominate when there are many nucleons present become less important than the structure of individual particle orbits for nuclei containing only a few nucleons. Thus in the lighter nuclei this molecular-like structure is not dominant.

Another type of oscillation, an octupole shape oscillation, has been identified for the first time in nuclei from 90Zr through 154Sm. This oscillation, occurring systematically at an excitation energy of Ex approximately 32/A to the 1/3 power MeV, accounts for all the missing octupole 1 hw oscillator strength in these nuclei.

SUPPORTED BY Robert A. Welch Foundation

8.0065, INTERACTING EXCITATIONS IN CONDENSED MATTER
J. RUVALDS, Univ. of Virginia, School of Arts & Sciences, *Charlottesville, Virginia* 22903 (DMR77-13167)

Research previously supported by DMR-72-02972.

Theoretical research on interacting excitations in various phases of condensed matter will be carried out. The following topics will be emphasized: (1) Quantum Liquids: The strong hybridization the He3 quasi particles with the phonon-roton branch in He3-He4 mixtures will be calculated. Also the effective He3-He4 coupling will be computed in search of the possible formation of a new superfluid phase in the mixtures. (2) Plasmon Excitations: Plasmon lifetimes in metals will be calculated and recent plasmon anomalies observed in electron loss measurements will be investigated. (3) Phonon Coupling and Phase Transitions: The connection between phonon coupling and certain structural phase instabilities will be considered with emphasis on metal hydrides which exhibit unusual superconducting properties. Of primary concern will be the role of anharmonicity in the phonon softening and its relation to the observed superconductivity at high temperatures.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0066, MONOLAYER PHYSICS
J.G. DASH, Univ. of Washington, School of Arts & Sciences, *Seattle, Washington* 98105 (DMR76-23939)

The research proposed here is a continuation of the work done under NSF Grant DMR72-03003. The program deals with films physically adsorbed on solid surfaces, exploring the quasi two-dimensional and registered phase of monolayers, the phase of multilayer films, and the evolution toward bulk behavior. Several individual projects involve a variety of systems and techniques. Magnetic ordering in oxygen-2 on graphite is studied by measuring specific heat and magnetic susceptibility. The influence of substrate texture and binding energy is explored by measuring specific heats of helium-3 and helium-4 on graphite preplated with neon and argon. Two-dimensional spreading pressures of films on grafoil are directly measured by a newly developed strain gauge. Work continues toward producing high-area, highly uniform magnesium oxide for low-temperature use. Continuing collaborations with other groups involve neutron diffraction, Mossbauer spectroscopy, and most recently, extended X-ray absorption fine structure.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0067, STATISTICAL MECHANICS OF SIMPLE SYSTEMS
L.W. BRUCH, Univ. of Wisconsin, School of Natural Sciences, *Madison, Wisconsin* 53706 (DMR74-19826 A01)

This work extends that carried out under NSF grant DMR74-19826. The overall thrust of this research is to apply various methods of statistical mechanics to atomic and simple molecular systems. Calculations will be based on models constructed from the best experimental and theoretical information available and will produce values for thermophysical properties that can be compared with experimental values. A number of specific types will be addressed, overlapping both low-temperature physics and chemical physics. These include: (a) Monolayers of xenon adsorbed on silver surfaces, (b) Non-additive intermolecular forces, e.g., three-body forces in helium and neon at short separation, (c) Polarizability of an inert gas diatom, (d) Binding energies of clusters of atoms, obeying both Bose and Fermi statistics, (e) Response functions for liquid helium in the range of momentum transfer applicable to Raman and neutron scattering experiments.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0068, MOLECULAR ADSORPTION AND SURFACE REACTIONS, COMBINING INFRARED REFLECTION-ADSORPTION SPECTROSCOPY WITH OTHER SURFACE TECHNIQUES
R.G. GREENLER, Univ. of Wisconsin, School of Letters & Science, *Milwaukee, Wisconsin* 53221 (DMR76-82937)

Infrared spectroscopy is used by the Principal Investigator as a tool for investigating the nature of molecular adsorption and reactions that take place on metal surfaces. The method of reflection-adsorption spectroscopy has been developed to the point where it can give measurable infrared bands from only a few percent of an adsorbed monolayer of CO (carbon monoxide). This technique is combined, in the same ultra-high vacuum system, with the instrumentation necessary to look at adsorption on a metal single crystal using LEED (Low Energy Electron Diffraction), Auger electron spectroscopy, mass-analyzed thermal desorption, and surface potential measurements. With these techniques the adsorption of CO, H2 (hydrogen) and other gases on various metal crystal faces are examined. Reflection-adsorption spectroscopy, along with mass-analyzed thermal desorption and Auger spectroscopy will be used also to study adsorption on evaporated metal films as well as metal-oxide catalyzed reactions of olefins. Finally, transmission spectroscopy will permit investigation of a small-particle effect on the spectra of molecules adsorbed on small metal particles supported on silica or alumina. The expected results may modify the interpretation of spectra obtained by other workers in a wide variety of infrared studies.

This is a continuation of research supported under DMR73-02346. First year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0069, EXTREME ULTRAVIOLET PHOTON-SURFACE INTERACTION
D. LICHTMAN, Univ. of Wisconsin, Graduate School, *Milwaukee, Wisconsin* 53201 (DMR74-03947 A01)

In a number of instances, impacting semiconductor surfaces with photons of band gap energy gives rise to efficient photodesorption. The role of surface impurity carbon in the adsorption-desorption process has been established. The present studies are concerned with graphite and metals such as niobium that form adherent semiconducting oxide surface layers. Experimental procedures include surface preparation by in situ sputter-

ing, analysis by Auger electron spectroscopy, and mass spectrometric measurement of photodesorbed species. A major interest is the energy dependence of the photodesorption cross section at energies well above threshold. These studies are expected to give further insight into the differences in photodesorptive behavior between metals and semiconductors.

This is a continuation of research supported under DMR 74-03947.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

SOCIAL SCIENCES

Includes Social Sciences (general); Administration and Management; Documentation and Information Science; Economics and Cost Analysis; Law and Political Science; and Urban Technology and Transportation.

9.0001, COMMITTEE ON COMMUNITY REACTIONS TO THE CONCORDE

UNKNOWN, Natl. Acad. of Sciences, *Washington, District of Columbia* 20037 (FA77WA-3919; FA59841 (TRAIS NO.))

The objective is to a) review and assess the adequacy of data on noise levels and community reactions currently being collected by the FAA with respect to the Concorde operations at Dulles International Airport; and b) to assist the FAA in designing a program of scientific research on noise levels and community reaction adequate to assess the impact of the Concorde on the area surrounding JFK International Airport.

SUPPORTED BY U.S. Dept. of Transportation, Office of the Secretary

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, SOLAR OSCILLATIONS

H.A. HILL, Univ. of Arizona, School of Liberal Arts, *Tucson, Arizona* 85721 (DF248760; F19628-77-C-0064)

AF function - communications, surveillance, detection, tracking. Deficiency - extremely limited knowledge of solar interior structure. Objective - determine the nature of possible solar oscillations and construct solar interior models based on these results. How research contributes - a detailed knowledge of solar interior structure is needed before accurate models capable of predicting the behavior of solar magnetic fields may be constructed.

Continue observations of solar oscillations with periods between ten and fifty minutes. Based on the derived amplitudes and frequencies of these oscillations solar interior models will be constructed. These models can then be used to investigate the origin of solar magnetic fields.

ADDENDA: Supporting agency address is: AF Geophysics Laboratory PH Hanscom AFB, Bedford, Mass 01730

SUPPORTED BY U.S. Dept. of Defense, Air Force

10.0002, SPECTROPHOTOMETRIC AND SPECTROPOLARIMETRIC STUDIES OF INTERSTELLAR AND CIRCUMSTELLAR MATTER

N.J. WOOLF, Univ. of Arizona, School of Liberal Arts, *Tucson, Arizona* 85721 (AST76-22110)

Observations of interstellar and circumstellar matter in the visible and near infrared region of the spectrum will be carried out. The main objects of the study are the distribution of matter and the degree of ionization around hot stars; the changes of polarization with spectral features in cool stars; mass ejection; waves travelling around stars; and the nature of Mira variability.

A Michelson Interferometer will be used for the majority of the observations. The observations will be used to help interpret the Copernicus satellite data which is in the ultraviolet region of the spectrum.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0003, OPTICAL OBSERVATIONS OF CELESTIAL X-RAY SOURCES

C.S. BOWYER, Univ. of California, School of Letters & Science, *Berkeley, California* 94720 (AST75-03735 A01)

X-ray astronomy is one of the newest fields of astronomical research, partly because it can be conducted only from above the Earth's atmosphere and partly because only now is our technology sufficiently developed to fully exploit this field. The most startling discovery in this field is that our Milky Way Galaxy contains objects emitting intense quantities of X-radiation but very little visible light, which is the opposite of the case of our own Sun and most other stars. Our understanding of these objects is preliminary, but it appears that many of them are compact stars such as white dwarfs, neutron stars, and black holes, in extremely advanced stages of evolution. Improved locations for these sources, obtained recently from satellite-borne experiments, have enabled us to identify and study several of their faint optical counterparts. The study of optical counterparts of the first known extra-solar extreme ultraviolet (EUV) sources has begun. The nature of these sources is virtually unknown, as no EUV sources were known to exist until they were discovered on the Apollo-Soyuz mission last year. Studies of the visible light emitted by X-ray and EUV objects will be carried out, using the most advanced optical technologies currently available. These studies will add greatly to our understanding of these systems and the final stages of stellar evolution.

This is a continuation of work previously supported by NSF grant AST75 03735.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0004, THE INTERSTELLAR GAS AND MAGNETIC FIELD

C. HEILES, Univ. of California, School of Letters & Science, *Berkeley, California* 94720 (AST74-17362 A03)

Studies of the structure and kinematics of the interstellar gas, and of the interstellar magnetic field as revealed by Zeeman splitting of spectral lines will be carried out. Interpretation of the existing 21cm line survey data will continue, with concentration towards consideration of the ramifications of the numerous expanding neutral hydrogen (HI) shells which have been recently discovered. There will be concentration on using differencing techniques to search for structure which is small in angular scale. A search for OH molecules and the measurement of temperatures behind the shock front associated with the HI expanding shells will be done. Enough Southern 21cm line data, taken by astronomers at the Instituto Argentino de Radioastronomia in collaboration with Dr. Heiles, have been obtained to present the first preliminary analysis of the interstellar medium in the Southern sky. The Southern data will be completed and combined with the Northern data to form a complete, unified sky survey.

The first Zeeman studies of the 21cm line seen in emission have begun. In addition to a number of tantalizing results which need further work, detection of large magnetic fields at seven positions in the Orion region will be completed. Zeeman studies of recombination lines in high-density regions where the field should be large will be continued.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0005, A STUDY OF VARIABILITY OF COMPACT NUCLEAR SOURCES BETWEEN THE LOBES OF RADIO GALAXIES

R.N. BRACEWELL, Stanford University, School of Engineering, *Palo Alto, California* 94305 (AST76-16712)

A significant sample of the nuclei of radio galaxies can readily be studied with the Stanford five (5) element radio interferometer. The nature of the time variations will reveal details of the physical processes occurring in the nuclei. Ten to fifteen nuclei of radio galaxies will be monitored on a weekly basis to determine variations in total intensity. Measurements of the linear and circular polarization of the radio sources will be made when observable. Radio maps at 10.7 GHz will be made of interesting sources already mapped at lower frequencies in order to discover more compact nuclear sources. Observations will be coordinated

with X-ray and gamma-ray observations when possible. If short-term variability is discovered in a source, the Stanford telescope will be available on a daily basis.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0006, UNSOLVED PROBLEMS OF QUIESCENT PROMINENCES AND THEIR CAVITIES AT 10.7 GHZ
R.N. BRACEWELL, Stanford University, School of Engineering, *Palo Alto, California* 94305 (ATM77-09072)

Quiescent prominences and filaments in the solar atmosphere are not well understood. Their structure depends on currents and magnetic fields in the chromosphere and low corona, a part of the solar atmosphere which ultimately is the origin of many impulsive events directly affecting the earth's upper atmosphere. Radio observations are a unique way of probing the solar atmosphere around prominences. The Stanford five-element array with a resolution of 17 arcsec is capable of resolving the prominence sheet and the surrounding cavity when seen projected against the disk. At a frequency of 10.7 GHz the transition region of the filament threads can be studied. Combined with optical observations the radio observations will test theoretical models and hence give important information on the presence of currents and on the topology of the magnetic fields around quiescent prominences. This grant will support such observations on these phenomena using the Stanford array.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

10.0007, ASTRONOMY RESEARCH AT THE OWENS VALLEY RADIO OBSERVATORY
A.T. MOFFET, Calif. Inst. of Technology, Graduate School, *Pasadena, California* 91109 (AST77-00247)

Extragalactic research will include studies of the kinematics, molecular content, and gas distribution of nearby galaxies using various spectral lines. Using very long baseline (VLB) techniques, compact sources will be mapped and variations in shape and intensity of compact sources will be monitored

Within our galaxy, various spectral lines will be used to study the kinematics of dense clouds, regions of star formation and certain stellar envelopes. The relation between H2O and OH masers and the infrared intensity of the associated stars will be investigated.

The nature of the rings of Saturn and of the Moon's crust will be studied with the aid of high-resolution mapping. A new interference polarimeter will be used to examine the small-scale structure of solar flares. A prototype 10-meter millimeter-wave telescope will be outfitted with receivers and used for observations of interstellar CO and other molecules. Installation of electronics and control systems for a three-element millimeter-wave interferometer will also be initiated.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0008, MEASUREMENT OF ATOMIC TRANSITION PROBABILITIES
W. WHALING, Calif. Inst. of Technology, Graduate School, *Pasadena, California* 91109 (AST76-81670)

This program will measure atomic transition probabilities useful for the quantitative analysis of hot gases and plasmas. The transition probabilities will be measured by (1) beam-foil time-of-flight measurements of the radiative lifetime of a level, followed by (2) branching ratio measurements to apportion the total transition probability among the individual transitions by which the level decays. Transitions selected for study will be those that are prominent in astrophysical spectra. During this funding period measurements will be made on the resonance lines of double-ionized iron, and there will be studies of the transition probabilities for lines in the wavelength region 1200-2000 A, starting with neutral carbon. Studies of transitions important for ground-based astronomy will deal with neutral manganese, vanadium, and other rare-earth ions.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0009, OBJECTIVE-PRISM RADIAL VELOCITIES OF STARS
A.R. UPGREN, Wesleyan University, Graduate School, *Middletown, Connecticut* 06457 (INT75-06683 A02)

This is a joint program between the Van Vleck Observatory of Wesleyan University, Middletown, Connecticut and the Fundacion Centro de Investigacion de Astronomia 'Francisco J. Duarte' in Merida, Venezuela, for the purpose of determining the radial velocities of groups of stars. Astronomers at the two observatories participate in the measuring, reduction and analysis of the results of the observations which are made in Venezuela. The observations consist of photographs taken with the wide-field Schmidt Telescope using an objective prism which causes each star to appear as a small spectrum. The positions of the lines in each spectrum can be measured and the radial (or line-of-sight) velocity can be determined from the measures since lines are shifted by the Doppler effect toward the violet (or red) if the star is approaching (or receding) and the amount of shift is proportional to the speed. The radial velocities of many thousands of stars can be determined only by this method. They can then be used to provide new and extensive information on the basic stellar components of our Milky Way Galaxy as well as its rotation. The new Venezuelan Schmidt Telescope has two unique advantages for this program: it is the largest in the world equipped with an objective prism and it is located near the Equator and thus can view all parts of the sky. The work contemplated is a continuation of research under a previous award, NSF No. OIP75-06683.

SUPPORTED BY U.S. National Science Foundation, Div. of International Programs

10.0010, STUDIES IN GALACTIC EVOLUTION
R.B. LARSON, Yale University, Graduate School, *New Haven, Connecticut* 06520 (AST76-15388)

Theoretical and/or observational research in a field related to the evolution of galaxies will be carried out by a post-doctoral associate in the Department of Astronomy at Yale University. The research will include research on dynamical models for the formation of galaxies; observational and theoretical studies of star formation and stellar evolution in galaxies; chemical abundances and evolution; and evolutionary effects in cosmology. The research will complement research carried out by faculty members and others engaged in related research at Yale University.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0011, AN OBSERVATIONAL INVESTIGATION OF THE NATURE AND EVOLUTIONARY STATUS OF THE RS CANUM VENATICORUM ECLIPSING BINARY STARS
F.B. WOOD, State University of Fla. Sys., School of Arts & Sciences, *Gainesville, Florida* 32601 (AST76-17591)

The RS Canum Venaticorum eclipsing binary stars present many interesting problems relative both to stellar structure and to stellar and binary evolution. A program of continued systematic observation of the light curves of these stars will be carried out. Emphasis will be placed on understanding the structure and evolutionary status of these stars by carefully analyzing light curves and the changes in these light curves. Photoelectric photometry will be carried out using the 18 and 30 inch telescopes of Rosemary Hill Observatory (University of Florida) and the 24 inch telescopes of Mount John University (Universities of Canterbury, Pennsylvania, and Florida) in New Zealand. A spectroscopic survey for new examples of the class in the southern hemisphere will be undertaken at Mount John.

Prior support was under NSF Grant GP 31710.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0012, STUDIES OF THE SOLAR CORONA
J.G. HIRSCHBERG, Univ. of Miami, School of Arts & Sciences, *Miami, Florida* 33124 (ATM77-02086)

This grant will permit Dr. Hirschberg, of the University of Miami, to perform coronagraphic measurements at the Sacramento Peak Observatory. The investigator will use a Fabry-Perot

interferometer to measure the Doppler line broadening and shifts of optical lines produced in the solar corona. These are related to the temperature and the heating of the solar corona. This is important to our understanding of the expansion of the solar corona and the way it evolves into the solar wind. This problem is presently not well understood but is very relevant to solar/terrestrial relations. Eclipse, satellite and coronagraph observations will be compared to theory in order to understand the mechanism of solar coronal heating.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

10.0013, COMPOSITION, PROPAGATION, AND ACCELERATION OF ENERGETIC PARTICLES IN THE SOLAR SYSTEM

P. MEYER, Univ. of Chicago, Graduate School, *Chicago, Illinois* 60637 (ATM77-04809)

Supported by the National Science Foundation, Prof. Meyer has carried out a research program aimed at elucidating problems connected with the acceleration and propagation of energetic particles in the solar system. Much of this work was concentrated on understanding the emission of relativistic electrons by the sun and in the solar system and on the effects of solar modulation of the electron component and its long-term changes with time.

This grant will extend these investigations for a period of three years. During that time he will continue the measurement using a balloon-borne particle spectrometer and coordinate this effort with the results from an instrument to be carried on the ISEE-C spacecraft. This latter instrument is being developed (with NASA support) and ISEE-C is scheduled for launch in late 1978. The ranges of electron energies observed by the balloon-borne detector and the satellite instrument overlap for a reasonably wide range, so that intercalibration is possible, but they are essentially complementary, with the satellite instrument covering electrons from 5 to 400 MeV, and the balloon instrument sensitive up to about 20 GeV. At energies below approximately 100 MeV, the balloon detector is dominated by atmospheric secondary particles and can not reliably determine the interplanetary electron spectrum.

The overall aim of this work is to understand a significant part of the solar 11 year variation.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

10.0014, SPECTRAL CHARACTERISTICS OF SOLAR RADIO BURSTS (PROGRAM FOR SUNSPOT MINIMUM)

A. MAXWELL, Harvard University, Harvard College Observatory, *Cambridge, Massachusetts* 02138 (ATM73-06431 A05)

This grant will supplement grant ATM-7306431. The funds will purchase equipment items which, when assembled together, will provide a new display unit for the solar radio spectrum analyzers in operation at the Harvard Radio Astronomy Station, Ft. Davis, Texas.

The Harvard Station is at present maintaining a solar radio program with five spectrum analyzers (i.e., sweep-frequency receivers), covering the band 25-580 MHz.

The Harvard Station intends to continue its present solar radio programs without break. The new display unit will be phased into operation without interruption to the programs. In 1978, the Station will expand its solar radio spectral observations to cover the band 25-2000 MHz, and it will take part in a cooperative program with investigators flying solar hard-X-ray equipment on board the International Sun-Earth Explorer satellite (ISEE-C), scheduled for launch in mid-1978. Cooperative programs are also being planned with investigators who will be flying equipment on board the Solar Maximum Mission (SMM), scheduled for launch in mid-1979. The Station will continue to provide regular summaries of its solar radio spectral data for regular publication in the NOAA-EDS Monthly Bulletin of Solar-Geophysical Data and will also continue to provide detailed information on solar radio bursts to individual scientists.

The installation of a new display unit, as described above, will materially assist in improving the quality and reliability of the solar radio programs at Fort Davis.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

10.0015, THE CHEMISTRY AND CHEMICAL EVOLUTION OF PLANETARY ATMOSPHERES

R.G. PRINN, Mass. Inst. of Technology, School of Science, *Cambridge, Massachusetts* 02139 (ATM77-01252)

This grant funds a theoretical and modeling study of the chemistry and chemical evolution of planetary atmospheres. Particular areas to be emphasized include photochemical models of the atmospheres of Venus, Mars, Jupiter, and Uranus, and the development of a unified theory of the origin and evolution of planetary atmospheres. This work is a follow-up to earlier work supported under NSF grant ATM-7414116.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

10.0016, ASTROMETRIC INTERFEROMETER

D.H. STAELIN, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (AST77-06052)

Optical stellar interferometry techniques show promise of being able to improve the measurement of stellar positions by a factor of 10 to 15 over conventional techniques. Such an advance greatly increases the chances for detecting neutron stars, black holes, and planets around nearby stars.

An existing pilot model interferometer with a 1.6 meter baseline will be improved and the basic system concepts will be demonstrated with observations of bright stars. Basic data about the propagation of starlight through the atmosphere will be obtained. Such data will be necessary for the design of future high-resolution interferometric instruments.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0017, VARIABLE STARS

D. HOFFLEIT, Maria Mitchell Observatory, *Nantucket, Massachusetts* 02554 (AST77-06974)

Variable stars are stars which exhibit changes in their color and brightness. These variations usually result from a periodic change in the star's atmosphere. Results from investigations of types and periods of variable stars are of interest for studies of galactic structure. The investigations of changing periods are important for stellar statistics and theories of stellar evolution. The Maria Mitchell Observatory is well equipped for photographic analyses of variable stars. Its photographic plate collection exceeds 5600 plates which span a time period of more than 50 years. The research to be done will concentrate on studying the variable stars which have slowly changing periods.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0018, A CATALOGUE OF STELLAR PROPER MOTIONS LARGER THAN 0.2 ARC SECOND ANNUALLY

W.J. LUYTEN, Univ. of Minnesota, Inst. of Technology, *Minneapolis, Minnesota* 55455 (AST76-80612)

Publication of a catalog of stars with proper motions in the range 0.2 to 0.5 arc second per year will be undertaken. Under support of this award, the first part, covering the sky between declination 30 North and the North Celestial Pole, will be prepared and published. The survey for these stars of large motion has been carried out on pairs of plates taken with an interval of 10 to 15 years at Palomar Mountain Observatory using the 48-inch Schmidt telescope. Measurement was carried out with the automated measuring machine furnished by NASA.

Publication of the catalog will make available to the astronomical community material useful for kinematic studies of the sun's neighborhood, for selection of candidates for distance measurement, for studies of the luminosity function of the stars to faint limits, and for astrophysical studies of selected individual stars.

Prior support was by NSF grant AST 77-13847.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0019, THE STUDY OF GEOLOGICAL MATERIALS BY THE METHODS OF PARTICLE TRACKS, ELECTRON MICROSCOPY, THERMOLUMINESCENCE, AND RARE GASES

R.M. WALKER, Washington University, School of Arts & Sciences, *St. Louis, Missouri* 63130 (EAR76-22697 A01)

This is a continuation of grant DES74-22752 A01, concerning the application of particle track and rare-gas isotopic analyses to the study of ancient nuclear events in meteoritic materials and in terrestrial uranium ores. The objectives of the project are (1) to determine the rare gas (primarily Xe) isotopic ratios and to analyze particle tracks in the acid residues and in both coarse- and fine-grained inclusions of the Allende and similar carbonaceous chondrites; and (2) to do detailed xenon isotope studies on traverse and core samples from the Oklo natural reactor and to search for other natural reactors by Xe isotopic surveys.

The results of these studies will contribute to the understanding of isotopic anomalies in meteorites and will establish boundary conditions on nucleo-synthesis processes. In turn, this will provide information on the origin and the early history of the solar system. Characterization of the Oklo material is necessary in order to determine the conditions under which natural chain reactions can occur in terrestrial environments.

SUPPORTED BY U.S. National Science Foundation, Div. of Earth Sciences

10.0020, AURORAL ELECTRON INTERACTIONS

R.L. KAUFMANN, Univ. of New Hampshire, School of Technology, *Durham, New Hampshire* 03824 (ATM77-01014)

This grant will extend the use of magnetometer and energetic particle data to investigate several problems associated with auroral electron acceleration and magnetohydrodynamic wave generation. A number of university groups will be working on various aspects of these topics, particularly during the International Magnetospheric Study period. The effort supported here will make a significant contribution to this worldwide effort. First priority is to fully utilize Dr. Arnoldy's rocket measurements of the auroral electron distribution function. These data will allow a study of the stability properties of the auroral plasma at rocket altitudes. When the plasma is unstable, it is possible to determine which wave mode should grow most rapidly. More frequently the plasma is just barely stable. At such times, a similar analysis will show which wave modes were unstable at higher altitudes. The waves presumably modified the electron distribution function through nonlinear processes until it reached the observed marginally stable state. These calculations should provide a good test of several aspects of plasma stability theory. In this sense, the work will represent one important step in attaining the goal of utilizing the magnetosphere as a plasma physics laboratory. The overall aim is to understand auroral precipitation.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

10.0021, STUDY OF SOLAR CONVECTION

P.J. GIERASCH, Cornell University, School of Arts & Sciences, *Ithaca, New York* 14853 (ATM76-10424 A01)

In the first phase of this effort, a self-consistent solar convection zone model was constructed, in which the heat flux is carried by linear convective modes. The mode amplitude is estimated by setting the size of neglected nonlinear terms equal to the linear terms in the dynamical equations. The degree of instability of the convective envelope is adjusted so that the modes carry the correct heat flux. Preliminary results have reproduced the granulation and the supergranulation. With this award the Principal Investigator will refine the treatment of the linear modes by improving the radiative damping approximation, to extend the calculation through the entire depth of the zone, and to treat other stars. Furthermore, he will also introduce the nonlinear terms into the equations, first in a limited way by retaining only a few mode-mode interactions, and then attempt to explain from first principles why the linear modes lead to accurate solutions.

The overall objective is to physically describe the (important) processes by which heat escapes from the sun. See previous form 4 (ATM-7610424).

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

10.0022, TRANSPARENT OVERLAYS OF THE MASTER LIST OF NON-STELLAR OBJECTS FOR THE PALOMAR SKY SURVEY PHOTOGRAPHS

J.D. KRAUS, Ohio State University, School of Engineering, *Columbus, Ohio* 43212 (AST76-08473)

A set of transparent plastic overlays mapping the objects in the Master List of Non-Stellar objects will be prepared and distributed for use with the Palomar Sky Survey photographs. Separate overlays for each field would be drawn by a computer-driven plotter, in such a way that the positions, sizes, shapes and names of all known non-stellar objects on each photograph would be directly shown. Other useful information such as coordinate grid lines, Smithsonian Astrophysical Observatory stars and known plate defects will also be included.

The proposed overlays would be very useful and widely used by the astronomical community. They will save a great deal of time, disseminate existing knowledge in the only practicable way for many purposes, and open new avenues of research.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0023, THE INTERNAL STRUCTURE OF DENSE INTERSTELLAR CLOUDS

A.N. WITT, Univ. of Toledo, School of Arts & Sciences, *Toledo, Ohio* 43606 (AST76-81564)

An observational study designed to produce detailed information on the internal structure of dense interstellar clouds will be carried out. The data obtained will lead to significant progress in three areas of importance: 1. The formation of interstellar molecules, particularly the simple species carbon monoxide, formaldehyde, carbon sulfide, ammonia, and hydroxyl radical in interstellar dust clouds. 2. The evolution of interstellar clouds, particularly the phase of initial gravitational collapse. 3. The interaction of gas and dust in the environment of dense interstellar clouds, leading to grain growth and depletion of gaseous components from the cloud. The observational techniques to be employed will vary with the distance, size, density, and galactic locations of a particular dense cloud but will include one or more of the following: 1. Photoelectric u, v, b, y, and H Beta photometry of stars in the line of sight to the cloud as well as in its vicinity. 2. Photographic starcounts in several broad photographic bandpasses, including the photographic infrared for very opaque clouds. 3. Photographic photometry in several bandpasses. 4. Surface brightness profile analysis, applicable to very dense nearby clouds or clouds seen at galactic latitudes greater than fifteen degrees.

Telescopes at the National Observatories at Kitt Peak, Arizona and Cerro Tololo, will be used for this purpose. The material will be supplemented with plates from the Palomar Observatory Sky Survey and the European Southern Observatory Atlas of the Southern Sky.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0024, CONTINUED PHOTOMETRY OF APPARENT CHANGES IN HDE 226868 (CYGNUS X-1)

R.J. DONNELLY, Oregon State Higher Educ. Sys., School of Liberal Arts, *Eugene, Oregon* 97401 (AST76-15447 A01)

In 1971 the ninth magnitude object HDE 226868 was identified as the optical counterpart of the X-ray source Cygnus X-1. Shortly thereafter, the discovery of periodic light variations provided support for a model of a binary stellar system consisting of a tidally distorted luminous star and a compact companion. It has been suggested that this compact, unseen companion is a black hole.

The research to be carried out on this grant consists of an analysis of observations of this stellar system made at the Pine Mountain Observatory in Oregon. The observations which have been and are continuing to be made at this observatory will be compared to observations made at other observatories. The results will provide a detailed description of the physical characteristics and behavior of the components of this binary system.

This grant provides additional funding for research previously supported under grant AST 76-15447.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0025, PHOTOMETRIC INVESTIGATIONS OF ECLIPSING BINARIES

E.G. EBBIGHAUSEN, Oregon State Higher Educ. Sys., School of Liberal Arts, *Eugene, Oregon* 97401 (AST75-05916)

Renewal of support will permit the accurate determination of the light curves and orbit elements of selected eclipsing binary stars, using the 15-inch and 24-inch telescopes at Pine Mountain Observatory during the summer of 1977. Candidate systems for intensive observation are the binaries C S Lacertae, V1143 Cygni, and EK Cephei selected from the Catalogue of Koch, Plavec, and Wood. The light curve at all phases will be covered for C S Lacertae which lacks photoelectric observations and for the other two as far as possible. Accurate times of minima will be emphasized for the second and third systems to check on possible apsidal motion in the orbits. Photometric orbital elements will be discussed for all three to improve the physical understanding of these systems. For the binary EK Cephei, since the secondary star is much cooler than the AO type primary, observations in the near infrared will be included to better determine the light curve around the time of secondary minimum, when the cooler star is eclipsed. Modest improvements will be made to the telescope and rapid data system to maintain reliability and efficiency at the mountain site.

Prior support was by NSF grant GP19021.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0026, THE MARTIAN CARTOGRAPHIC COORDINATES AND THE ROTATIONAL ELEMENTS OF MARS

G.H. DEVAUCOULEURS, Univ. of Texas, School of Natural Sciences, *Austin, Texas* 78712 (AST76-81090)

The ephemeris for physical observations of Mars, in the national ephemerides, is based on the coordinates of the north pole of Mars, its rotational period, and the value for the longitude of the central meridian at a selected epoch. Extensive new data from radar observations and by direct imaging from spacecraft have made accurate cartography of the Martian surface possible. To use this as a basis for the physical ephemeris of Mars, it is essential to relate the new cartographic coordinates rigorously to the rotational elements.

The International Astronomical Union has recommended a new set of physical elements of Mars be adopted and a new physical ephemeris of Mars based on these elements be published when two critical unknowns have been determined: 1) An improved value for the rotation period of Mars from the past 3 centuries of observations, and 2) The relation between the traditional system of areographic coordinates and the new system adopted for the Mariner 9 cartographic results.

This investigation will complete the analysis of central meridian transits and areographic longitude data for the period 1877-1971 and extend it to the period 1659-1875, to derive a definitive value for the rotation period of Mars, also make detailed comparisons between the coordinates of surface features from telescopic observations and from Mariner 6, 7, and 9 to establish the zero-point differences between the old and new systems.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0027, COSMOTHERMOMETRY OF CARBONACEOUS CHONDRITES

M.W. ROWE, Texas A & M University System, School of Science, *College Station, Texas* 77843 (A-469)

Studies on the magnetic properties of the most primitive meteorites known, begun about four years ago, are finished. We began with a summary of the magnetism in meteorites: Meteoritics 7, 263-284 (1972); ibid., 9, 289-305 (1974). Thermal calculations led us to consider an inhomogeneous accretion for origin of planets: Nature 244, 40-41 (1973). This was followed by a sytematic study of thermomagnetic properties of all carbonaceous meteorites. Studies on the thermomagnetic properties of C2 chrondrites (Earth Planet, Sci. Lett., 27, 101-107 (1975)), indicated that they differed markedly from the C1 chrondrites (ibid., 21, 345-350 (1974)). The C3 and C4 chrondrites were found to be even more diverse in their magnetic properties (ibid., 29, 283-290 (1976)), indicating a complicated origin. The thermomagnetic behavior of the ureilites indicated a more reducing atmosphere during their formation than for most carbonaceous chondrites (to be submitted to Earth Planet. Sci. Lett.).

We concluded that the magnetic mineralogy, and by implication, the bulk mineralogy of the carbonaceous meteorites, is varied and complex--considerably more so than indicated by whole rock chemical analyses. Consequently it is obvious that the origin of the carbonaceous meteorites cannot be described by a simple model. We concluded further that estimates of the intensity of the ancient magnetic fields of meteorite parent bodies should be viewed with reservation.

SUPPORTED BY Robert A. Welch Foundation

10.0028, FISSION PRODUCTS IN THE EARTH'S CRUST

H.E. HALL, Sam Houston State University, School of Science, *Huntsville, Texas* 75428 (X-313)

The objective of this work is to determine quantitatively the effect of cosmic radiation on the distribution of fission products in the earth's crust. Fission products are produced in the crust by cosmic-ray-produced neutrons interacting with heavy elements in the crust. Electromagnetic radiations in the energy range 5-200 KeV from 97.5 percent uranium ore concentrate and three different pure rare-earth oxides detected by an intrinsic Ge detector are being analyzed. Naturally occurring characteristic X-rays of the elements present in the sample are emitted along with gamma radiations. Fluorescence by internal and external radiation sources, including cosmic radiation, appears to be the primary excitation source. Several geologic samples tested also emit characteristic X-rays of elements present.

Instrumentation and data reduction technique advances include interfacing a pulse height analyzer to a programmable calculator having a plotter output. Work to date has shown that digital filtering is advantageous when unknown peaks are present, whereas least square techniques are better for quantitative determination of peaks having known positions.

SUPPORTED BY Robert A. Welch Foundation

10.0029, RIES CRATER STUDIES

E.C. CHAO, U.S. Dept. of The Interior, Geological Survey, *Herndon, Virginia* 22092 (9580-01457)

The Ries Basin of Southern Germany, largest of the well-preserved impact craters on Earth and best analog for lunar and planetary shallow multiring basins, is the focus of our studies which seek answers to still unresolved problems of provenance of lunar highland breccias, and characteristics of lunar crater ejecta and the mechanisms of their transport. During the present year we are conducting an investigation of core samples obtained in 1976 work, representing complete sections of Ries ejecta at two locations, one (at Otting) about 1/4 crater radius beyond the crater rim and the other (at Itzing) approximately 1/2 crater radius beyond the crater rim. The objective of this study is characterization of the nature of and vertical variation within the Ries sedimentary ejecta. Laboratory studies of thin sections representing various depths in the Ries 1973 research deep drill core, will examine inter- and intragranular microfractures in minerals as effects of low shock pressures. Another task is a study of the distribution, abundance and different degrees of shock in inclusions in Ries impact glasses. Findings will be used for comparison with fragment-laden lunar melt rocks for which the origin of the melt is presently undetermined.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

10.0030, PECULIAR CENTRAL STARS OF PLANETARY NEBULAE

J.H. LUTZ, Washington State University, School of Arts & Sciences, *Pullman, Washington* 99163 (AST75-10353 A01)

Some planetary nebulae have peculiar central stars which are apparently too cool to be responsible for the observed ionization of the nebular shell. A spectroscopic survey of known and suspected peculiar central stars has been carried out and, from the results of the survey, six peculiar objects have been selected for detailed analysis. High-dispersion spectroscopy of these six peculiar objects will be made. The distances to these stars will be determined. The high-dispersion spectra will be used to determine electron densities, temperatures and chemical abundances in the nebulae. This study of the spectra and distances of the peculiar central stars will yield information about the role of planetary nebulae in stellar evolution. This is a renewal of NSF Grant AST 75-10353.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

GENERAL

11.0001, IMPROVEMENT OF UNDERGRADUATE INSTRUCTION IN ASTRONOMY BY THE IMPLEMENTATION OF AN OBSERVATION CENTER

R. SWIFT, St. Anselms College, Undergraduate School, *Manchester, New Hampshire* 03102 (SER77-06324)

The New Hampshire College and University Council (NHCUC) is an association of 13 four-year, accredited public and private colleges in New Hampshire. NHCUC members are: Colby-Sawyer College, Franconia College, Franklin Pierce College, Keene State College; Count Saint Mary College, Nathaniel Hawthorne College, New England College, New Hampshire College, Notre Dame College, Plymouth State College, Rivier College, St. Anselm's College, University of New Hampshire.

The project proposes the improvement of undergraduate Astronomy courses and curricula as well as the development of shared facilities including the building of an Observatory Center at St. Anselm's College. The Center which will house two telescopes owned by the college and will contribute to the development of Astronomy in the other colleges in the consortium. The faculty from the various colleges will share curriculum planning but will also develop special programs for their respective institutions.

SUPPORTED BY U.S. National Science Foundation, Div. of Science Education Resources Improvement

American Institute of Aeronautics and Astronautics

announces

Two New Films

America's Wings

The spirit and joy of creativity as exemplified in aircraft design is the story of this film. America's Wings looks at everything that has happened since Kitty Hawk and the "somebodies" who made it happen. (28.5 minutes, 16 mm color)

The Age of Space Transportation

Every breakthrough in transportation, from the wheel to the jet engine, has brought with it enormous social change. "The Age of Space Transportation" takes a particular look at mankind's next giant step in moving around -- the Space Shuttle, the vehicle itself and its implications. (20 minutes, 16 mm)

For information on obtaining these films, contact:
American Institute of Aeronautics and Astronautics
1290 Avenue of the Americas
New York, N.Y. 10019

VOLUME 15 NUMBER 24 / DECEMBER 23, 1977

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N77-33100*# Aerophysics Research Corp., Bellevue, Wash.
NSEG: A SEGMENTED MISSION ANALYSIS PROGRAM FOR LOW AND HIGH SPEED AIRCRAFT. VOLUME 2: PROGRAM USERS MANUAL
D. S. Hague and H. L. Rozendaal Washington NASA Sep. 1977 175 p
(Contract NAS1-13599)
(NASA-CR-2808) Avail: NTIS HC A08/MF A01 CSCL 09B

A rapid mission analysis code based on the use of approximate flight path equations of motion is described. Equation form varies with the segment type, for example, accelerations, climbs, cruises, descents, and decelerations. Realistic and detailed vehicle characteristics are specified in tabular form. In addition to its mission performance calculation capabilities, the code also contains extensive flight envelop performance mapping capabilities. Approximate take off and landing analyses can be performed. At high speeds, centrifugal lift effects are taken into account. Extensive turbojet and ramjet engine scaling procedures are incorporated in the code. Author

N77-33101# Boeing Vertol Co., Philadelphia, Pa.
PRODUCT IMPROVEMENT PROGRAM EVALUATION Final Report, 17 May 1976 - 17 Feb. 1977
Stephen J. Blewitt Jun. 1977 118 p refs
(DA Proj. 1F2-62209-AH-76)
(AD-A042134; D210-11146-2; USAAMRDL-TR-77-17) Avail: NTIS HC A06/MF A01 CSCL 01/3

This report presents the results of a study to develop an analysis technique for evaluating the cost and operational effectiveness of potential aircraft modifications that affect reliability and maintainability. Author (GRA)

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N77-33102*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
THREE DIMENSIONAL STEADY AND UNSTEADY ASYMMETRIC FLOW PAST WINGS OF ARBITRARY PLANFORMS
O. A. Kandil, E. H. Atta, and A. H. Nayfeh Sep. 1977 33 p refs
(Grant NGR-47-004-090)
(NASA-CR-145235) Avail: NTIS HC A03/MF A01 CSCL 01A

The nonlinear discrete vortex method was extended to treat the problem of asymmetric flows past a wing with leading-edge separation, including steady and unsteady flows. The problem was formulated in terms of a body-fixed frame of reference, and the nonlinear discrete vortex method was modified accordingly. Only examples of flows past delta wings are presented. Comparison of these results with experimental results for a delta wing undergoing a steady rolling motion at zero angle of attack demonstrates the superiority of the present method in obtaining highly accurate loads. Numerical results for yawed wings at large angles of attack are also presented. In all cases, total load coefficients, pressure distributions and shapes of the free-vortex sheets are shown. Author

N77-33103*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
PRESSURE DISTRIBUTIONS ON A 1- BY 3-METER SEMISPAN WING WITH A NONSTREAMWISE TIP IN SUBSONIC FLOW
Long P. Yip and Gary L. Shubert (Joint Inst. for Advan. of Flight Sci., Hampton, Va.) Aug. 1977 205 p refs
(NASA-TM-72755) Avail: NTIS HC A10/MF A01 CSCL 01A

Pressure distributions on a 1- by 3-meter semispan wing with a tip that is streamwise at 0 deg sweep are presented. The tip becomes nonstreamwise as the wing is swept. At 0 deg sweep angle, the semispan wing has a taper ratio of 1.0 and NACA 0012 airfoil section contours. The test was conducted in the Langley V/STOL tunnel at a freestream dynamic pressure of 2.46 kPa. Pressure distributions are presented for sweep angles of 10, 20, 30, and 40 with an angle of attack range from -6 deg to 20 deg. The data are presented without analysis or discussion. Author

N77-33104*# Kansas Univ., Lawrence.
FLIGHT EVALUATION OF AN ADVANCED TECHNOLOGY LIGHT TWIN-ENGINE AIRPLANE (ATLIT)
Bruce J. Holmes Washington NASA Jul. 1977 286 p refs
(Grant NGR-17-002-072)
(NASA-CR-2832) Avail: NTIS HC A13/MF A01 CSCL 01A

Project organization and execution, airplane description and performance predictions, and the results of the flight evaluation of an advanced technology light twin engine airplane (ATLIT) are presented. The ATLIT is a Piper PA-34-200 Seneca I modified by the installation of new wings incorporating the GA(W)-1 (Whitcomb) airfoil, reduced wing area, roll control spoilers, and full span Fowler flaps. The conclusions for the ATLIT evaluation are based on complete stall and roll flight test results and partial performance test results. The Stalling and rolling characteristics met design expectations. Climb performance was penalized by extensive flow separation in the region of the wing body juncture. Cruise performance was found to be penalized by a large value of zero lift drag. Calculations showed that, with proper attention to construction details, the improvements in span efficiency and zero lift drag would permit the realization of the predicted increases in cruising and maximum rate of climb performance. Author

N77-33105*# Aeronautical Research Associates of Princeton, Inc., N. J.

VORTEX INTERACTIONS AND DECAY IN AIRCRAFT WAKES Final Report

Alan J. Bilanin, Milton E. Teske, Coleman DuPDonaldson, and Guy G. Williamson Washington NASA Sep. 1977 121 p refs

(Contract NAS1-13939)

(NASA-CR-2870) Avail: NTIS HC A06/MF A01 CSCL 20D

The dynamic interaction of aircraft wake vortices was investigated using both inviscid and viscous models. For the viscous model, a computer code was developed using a second-order closure model of turbulent transport. The phenomenon of vortex merging which results in the rapid aging of a vortex wake was examined in detail. It was shown that the redistribution of vorticity during merging results from both convective and diffusive mechanisms. Author

N77-33106*# Pennsylvania State Univ., University Park.

EXPERIMENTAL AND THEORETICAL INVESTIGATION OF THREE-DIMENSIONAL TURBULENT BOUNDARY LAYERS AND TURBULENCE CHARACTERISTICS INSIDE AN AXIAL FLOW INDUCER PASSAGE Final Report. Ph.D. Thesis, Jun. 1971

A. K. Anand and B. Lakshminarayana Aug. 1977 219 p refs

(Grant NGL-39-009-007)

(NASA-CR-2888) Avail: NTIS HC A10/MF A01 CSCL 01A

Analytical and experimental investigations of the characteristics of three dimensional turbulent boundary layers in a rotating helical passage of an inducer rotor are reported. Expressions are developed for the velocity profiles in the inner layer, where the viscous effects dominate, in the outer layer, where the viscous effects are small, and in the interference layer, where the end walls influence the flow. The prediction of boundary layer growth is based on the momentum integral technique. The equations derived are general enough to be valid for all turbomachinery rotors with arbitrary pressure gradients. The experimental investigations are carried out in a flat plate inducer 3 feet in diameter. The mean velocity profiles, turbulence intensities and shear stresses, wall shear stress, and limiting streamline angles are measured at various radial and chordwise locations by using rotating probes. The measurements are in general agreement with the predictions. The radial flows are well represented by an expression which includes the effect of stagger angle and radial pressure gradient. The radial flows in the rotor channel are higher than those on a single blade. The collateral region exists only very near the blade surface. The radial component of turbulence intensity is higher than the streamwise component because of the effect of rotation. Author

N77-33107*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NONLINEAR AEROELASTIC EQUATIONS FOR COMBINED FLAPWISE BENDING, CHORDWISE BENDING, TORSION, AND EXTENSION OF TWISTED NONUNIFORM ROTOR BLADES IN FORWARD FLIGHT

Krishna Rao V. Kaza and Raymond G. Kvaternik (NASA. Langley Res. Center) Aug. 1977 111 p refs

(NASA-TM-74059) Avail: NTIS HC A06/MF A01 CSCL 01A

Second-degree nonlinear aeroelastic equations were developed using Hamilton's principle. The implications of the slender beam approximation as applied to the derivation of the second-degree nonlinear equations of motion are discussed and a mathematical ordering scheme which is compatible with the assumption of a slender beam is introduced. The blade aerodynamic loading was obtained from strip theory based on a quasi-steady approximation of two dimensional, incompressible unsteady airfoil theory. The equations were compared with several of those existing in the literature and the results are discussed. Author

N77-33108*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

SUBSONIC LONGITUDINAL AERODYNAMIC CHARACTERISTICS AND ENGINE PRESSURE DISTRIBUTIONS FOR AN AIRCRAFT WITH AN INTEGRATED SCRAMJET DESIGNED FOR MACH 6 CRUISE

Jarrett K. Huffman, Charles H. Fox, Jr., and Patrick J. Johnston Aug. 1977 400 p refs

(NASA-TM-X-73911) Avail: NTIS HC A17/MF A01 CSCL 01A

A 1/10-scale model of a proposed hypersonic aircraft with an integrated scramjet was tested. The investigation took place over a Mach number range from 0.2 to 0.7 and an angle of attack range from 2 deg to approximately 17 deg at a sideslip angle of 0 deg. The primary configuration variables studied were engine location, internal engine geometry, and external engine geometry. The results are presented without analysis. Author

N77-33109# Royal Inst. of Tech., Stockholm (Sweden). Div. of Gasdynamics.

FINITE-DIFFERENCE METHODS FOR PLANE STEADY INVISCID TRANSONIC FLOWS Ph.D. Thesis

Laszlo Fuchs 1977 188 p refs

(TRITA-GAD-2) Avail: NTIS HC A09/MF A01

The finite difference computation of plane steady transonic flow over airfoils was considered. The small disturbance approximation was discretized by two methods. The type-dependent method and a type-independent form of a viscous equation were used. The last form contains a free parameter, the viscosity coefficient, which was used to extrapolate the solution to less viscous solutions making possible the efficient computation of shock flows. For the transonic potential equation, a number of discretizations were considered in conservation form. They differ in the added viscous term in supersonic regions. When non-uniqueness was not physically excluded, convergence to two different limits was possible as mesh size and viscosity were reduced. The limits corresponded to weak and strong shock solutions. Author

N77-33110*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

PREDICTION OF STATIC AERODYNAMIC CHARACTERISTICS FOR SLENDER BODIES ALONE AND WITH LIFTING SURFACES TO VERY HIGH ANGLES OF ATTACK

Leland Howard Jorgensen Washington Sep. 1977 244 p refs

(NASA-TR-R-474; A-6968) Avail: NTIS HC A11/MF A01 CSCL 01A

An engineering-type method is presented for computing normal-force and pitching-moment coefficients for slender bodies of circular and noncircular cross section alone and with lifting surfaces. In this method, a semi-empirical term representing viscous-separation crossflow is added to a term representing potential-theory crossflow. For many bodies of revolution, computed aerodynamic characteristics are shown to agree with measured results for investigated free-stream Mach numbers from 0.6 to 2.9. The angles of attack extend from 0 deg to 180 deg for M = 2.9 from 0 deg to 60 deg for M = 0.6 to 2.0. For several bodies of elliptic cross section, measured results are also predicted reasonably well over the investigated Mach number range from 0.6 to 2.0 and at angles of attack from 0 deg to 60 deg. As for the bodies of revolution, the predictions are best for supersonic Mach numbers. For body-wing and body-wing-tail configurations with wings of aspect ratios 3 and 4, measured normal-force coefficients and centers are predicted reasonably well at the upper test Mach number of 2.0. Vapor-screen and oil-flow pictures are shown for many body, body-wing and body-wing-tail configurations. When spearation and vortex patterns are asymmetric, undesirable side forces are measured for the models even at zero sideslip angle. Generally, the side-force coefficients decrease or vanish with the following: increase in Mach number, decrease in nose fineness ratio, change from sharp to blunt nose, and flattening of body cross section (particularly the body nose). Author

N77-33111*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

SPIN-TUNNEL INVESTIGATION OF THE SPINNING CHARACTERISTICS OF TYPICAL SINGLE-ENGINE GENERAL AVIATION AIRPLANE DESIGNS. 1. LOW-WING MODEL A: EFFECTS OF TAIL CONFIGURATIONS

Sanger M. Burk, Jr., James S. Bowman, Jr., and William L. White Sep. 1977 92 p refs

(NASA-TP-1009; L-11227) Avail: NTIS HC A05/MF A01 CSCL 01A

The effects of tail design on spin and recovery were investigated in a spin tunnel. A 1/11-scale model of a research airplane which represents a typical low-wing, single engine, light

general aviation airplane was used. A tail design criterion for satisfactory spin recovery for light airplanes was evaluated. The effects of other geometric design features on the spin and recovery characteristics were also determined. Results indicate that the existing tail design criterion for light airplanes, which uses the tail damping power factor as a parameter, cannot be used to predict spin-recovery characteristics. Author

N77-33112*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THEORETICAL PARAMETRIC STUDY OF THE RELATIVE ADVANTAGES OF WINGLETS AND WING-TIP EXTENSIONS
Harry H. Hayson, Gregory D. Riebe, and Cynthia L. Fulton Sep. 1977 75 p refs
(NASA-TP-1020; L-11679) Avail: NTIS HC A04/MF A01 CSCL 01A

It was found that for identical increases in bending moment, a winglet provides a greater gain in induced efficiency than a tip extension. Winglet toe-in angle allows design trades between efficiency and root moment. A winglet showed the greatest benefit when the wing loads were heavy near the tip. Washout diminished the benefit of either tip modification, and the gain in induced efficiency became a function of lift coefficient; heavy wing loadings obtained the greatest benefit from a winglet, and low speed performance was enhanced even more than cruise performance. Both induced efficiency and bending moment increased with winglet length and outward cant. The benefit of a winglet relative to a tip extension was greatest for a nearly vertical winglet. Root bending moment was proportional to the minimum weight of bending material required in the wing; it is a valid index of the impact of tip modifications on a new wing design. Author

N77-33113*# Hamilton Standard, Windsor Locks, Conn.
STUDY OF NOISE AND INFLOW DISTORTION SOURCES IN THE NASA QF-1B FAN USING MEASURED BLADE AND VANE PRESSURES Final Report
Donald B. Hanson Washington NASA Sep. 1977 85 p refs (Contract NAS3-19749)
(NASA-CR-2899) Avail: NTIS HC A05/MF A01 CSCL 20A

Pressure transducers were installed on the blades and vanes of QF-1B, a transonic-tip-speed fan from the NASA Quiet Fan Program which was tested on the outdoor quiet fan test facility at NASA-Lewis. Signals from the transducers and from far field microphones were analyzed to determine sources of nonuniform inflow and noise. The nonuniform inflow was mostly unsteady with roughly equal contributions from atmospheric turbulence and rig interference. The rig interference was largest at the bottom and appeared to be generated by the support structure which was located behind the inlet lip under the fan. Interaction of this inflow distortion was the dominant source of noise at 1, 2, and 3 times blade passing frequency (BPF) at 60, 70, and 80 percent of design speed. At 90 percent speed, noise at BPF was dominated by the steady rotor field. A broadband spectrum peak centered at about 2.2 times BPF was identified as rotor/stator interaction stemming from a high frequency rotor exit flow component. The remaining broadband energy from 0.3 to 3.5 times BPF was attributed to the better known type of rotor/stator interaction associated with rotor wake turbulence. Author

N77-33114*# Douglas Aircraft Co., Inc., Long Beach, Calif.
WIND TUNNEL AND ANALYTICAL INVESTIGATION OF OVER-THE-WING PROPULSION/AIR FRAME INTERFERENCES FOR A SHORT-HAUL AIRCRAFT AT MACH NUMBERS FROM 0.6 TO 0.78 Final Report
O. D. Wells, M. L. Lopez, H. R. Welge, P. A. Henne, and A. E. Sewell Washington NASA Sep. 1977 244 p refs (Contract NAS3-18284)
(NASA-CR-2905; MDC-J7601) Avail: NTIS HC A11/MF A01 CSCL 01A

Results of analytical calculations and wind tunnel tests at cruise speeds of a representative four engine short haul aircraft employing upper surface blowing (USB) with a supercritical wing are discussed. Wind tunnel tests covered a range of Mach number M from 0.6 to 0.78. Tests explored the use of three USB nozzle configurations. Results are shown for the isolated wing body and for each of the three nozzle types installed. Experimental results indicate that a low angle nacelle and streamline contoured nacelle yielded the same interference drag at the design Mach number. A high angle powered lift nacelle had higher interference drag primarily because of nacelle boattail low pressures and flow separation. Results of varying the spacing between the nacelles and the use of trailing edge flap deflections, wing upper surface contouring, and a convergent-divergent nozzle to reduce potential adverse jet effects were also discussed. Analytical comparisons with experimental data, made for selected cases, indicate favorable agreement. Author

N77-33115*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
TRANSONIC WIND-TUNNEL INVESTIGATION OF THE MANEUVER POTENTIAL OF THE NASA SUPERCRITICAL WING CONCEPT, PHASE 1
James B. Hallissy and Theodore G. Ayers Washington Sep. 1977 295 p refs
(NASA-TM-X-3534; L-11064) Avail: NTIS HC A13/MF A01 CSCL 01A

An investigation was conducted in the NASA Langley 8-foot transonic pressure tunnel at Mach numbers from 0.60 to 0.975 with a variable-wing-sweep airplane model in order to evaluate a series of wings designed to demonstrate the maneuver potential of the supercritical airfoil concept. Both conventional and supercritical wing designs for several planform configurations were investigated with wing sweep angles from 16.0 deg to 72.5 deg, depending on Mach number and wing configuration. The supercritical wing configuration showed significant improvements over the conventional configurations in drag-divergence Mach number and in drag level at transonic maneuver conditions. Author

N77-33116*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
TRANSONIC AERODYNAMIC CHARACTERISTICS OF A SUPERCRITICAL-WING TRANSPORT MODEL WITH TRAILING-EDGE CONTROLS
Michael J. Mann and Richard A. Langhans Washington Oct. 1977 336 p refs
(NASA-TM-X-3431; L-10871) Avail: NTIS HC A15/MF A01 CSCL 01A

The effects of wing trailing-edge control surfaces on the static transonic aerodynamic characteristics of a transport configuration with a supercritical wing were studied. The configuration was tested with both an area-ruled fuselage and a cylindrical fuselage. The Mach number range was from 0.80 to 0.96 and the angle of attack range was from -1 deg to 12 deg. The Reynolds number was 1,580,000 based on the mean aerodynamic chord. Tabular data are presented. Author

N77-33117*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
TRANSONIC AERODYNAMIC CHARACTERISTICS OF A SUPERCRITICAL-WING TRANSPORT MODEL WITH TRAILING-EDGE CONTROLS, SUPPLEMENT, PART 1
Michael J. Mann and Richard A. Langhans Washington Oct. 1977 493 p
(NASA-TM-X-3431-Pt-1) Avail: NTIS HC A21/MF A01 CSCL 01A

For abstract, see N77-33116.

N77-33118*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
TRANSONIC AERODYNAMIC CHARACTERISTICS OF A SUPERCRITICAL-WING TRANSPORT MODEL WITH TRAILING-EDGE CONTROLS
Michael J. Mann and Richard A. Langhans Washington Oct. 1977 480 p
(NASA-TM-X-3431-Pt-2) Avail: NTIS HC A21/MF A01 CSCL 01A

For abstract, see N77-33116.

N77-33119*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
TRANSONIC AERODYNAMIC CHARACTERISTICS OF A SUPERCRITICAL-WING TRANSPORT MODEL WITH TRAILING EDGE CONTROLS

Michael J. Mann and Richard A. Langhans Washington Oct. 1977 498 p
(NASA-TM-X-3431-Pt-3) Avail: NTIS HC A21/MF A01 CSCL 01A

For abstract, see N77-33116.

N77-33120*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
TRANSONIC AERODYNAMIC CHARACTERISTICS OF A SUPERCRITICAL-WING TRANSPORT MODEL WITH TRAILING-EDGE CONTROLS
Michael J. Mann and Richard A. Langhans Washington Oct. 1977 476 p
(NASA-TM-X-3431-Pt-4) Avail: NTIS HC A21/MF A01 CSCL 01A

For abstract, see N77-33116.

N77-33121*# Textron Bell Aerospace Co., Buffalo, N. Y. Niagara Frontier Operations.
UNSTEADY SUPERSONIC AERODYNAMIC THEORY FOR INTERFERING SURFACES BY THE METHOD OF POTENTIAL GRADIENT Final Report
William P. Jones (Tex. A&M Univ., College Station) and Kari Arppa Washington NASA Oct. 1977 38 p refs
(Contract NAS1-13986)
(NASA-CR-2898) Avail: NTIS HC A03/MF A01 CSCL 01A

A generalized solution of the hyperbolic wave equation was further developed to relate the velocity components at a field point to the potential gradient distribution in the dependence domain. Singular integrals were evaluated in closed form, with numerical integration methods for more complex but analytic functions. Idealization of the lifting surfaces by trapezoidal elements with two sides parallel to the streamlines is computationally efficient. Streamwise integrals were performed analytically, and spanwise integrals were neccessary only on element leading and trailing sides. All integrands vanish on the Mach cone. Pressure distribution on a double delta wing and generalized aerodynamic coefficients for three AGARD planforms were calculated and compared with available results. Author

N77-33122# Naval Postgraduate School, Monterey, Calif.
INITIAL UNSTEADY AERODYNAMIC MEASUREMENTS OF A CIRCULATION CONTROLLED AIRFOIL AND AN OSCILLATING FLOW WIND TUNNEL M.S. Thesis
Emmett John Lancaster Jun. 1977 74 p refs
(AD-A042102) Avail: NTIS HC A03/MF A01 CSCL 20/4

Steady state results of lift developed by varying the momentum blowing coefficient C sub mu upon a refurbished Circulation Control Rotor (CCR) airfoil section were favorable. This thesis was an experimental investigation to quantitatively evaluate whether the steady state results could be applied by a quasi-steady assumption when a harmonic perturbation of C sub mu was superimposed upon the steady value. Results suggested an attenuation in the dynamic transfer function of dC sub P/d C sub mu as the oscillating blowing frequency was increased. Initial measurements indicated that the RMS C sub P perturbation was an order of magnitude greater than the normalized RMS velocity perturbation. To further clarify this situation, investigations were conducted to establish a dynamic frequency response calibration of the wind tunnel. Results confirmed the order of magnitude difference between the RMS C sub P and normalized RMS velocity perturbations, indicating, that the tunnel flow environment was governed by Euler's equation in its complete form rather than with the simplifications which lead to the quasi-steady small perturbation theory. GRA

N77-33123# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio. Aerodynamics and Airframe Branch.
THE CONICALLY SYMMETRIC NAVIER STOKES EQUATIONS: NUMERICAL SOLUTION FOR HYPERSONIC CONE FLOW AT HIGH ANGLE OF ATTACK Ph.D. Thesis - AF Inst. of Technology.
David S. McRae Mar. 1977 104 p refs
(AD-A042072; AFFDL-TR-76-139) Avail: NTIS HC A06/MF A01 CSCL 20/4

Solutions were obtained for hypersonic flow over sharp cones at high angle of attack by numerically integrating through use of MacCormack's method the Navier-Stokes equations subject to a conical symmetry assumption. The boundary conditions for the integration were chosen to match experimental conditions. A technique (normal stress damping) was developed to provide damping of the numerical oscillations occurring at shock discontinuities during the integration. The general features which appeared in experiment were shown to appear in the results of the integration, including the proper behavior, in laminar flow, of the viscous layer and the vertical singularity. A thinner calculated lee side viscous layer was attributed to failure of the present technique to model non-conical nose effects. A solution obtained just upstream of boundary layer transition agreed with experiment when conically projected into the turbulent regime. The adequacy of the conical symmetry assumption is therefore indicated for the turbulent regime on conical bodies. GRA

N77-33124# Naval Postgraduate School, Monterey, Calif.
AN ANALYSIS OF PERSONNEL PARACHUTES FOR USE BY MARINE CORPS FORCE RECONNAISSANCE UNITS M.S. Thesis
Robert Joseph McLaughlin Mar. 1977 125 p refs
(AD-A041151) Avail: NTIS HC A06/MF A01 CSCL 01/3

There is an opportunity for the Marine Corps to adopt a free-fall parachute, especially for Force Reconnaissance units, where the emphasis is on achieving an assigned mission for the Force Commander. The subject of this thesis is to explore the field of free-fall and high-glide parachutes currently in use within the military establishment and the civilian community and to develop a model for selecting the most cost-effective free-fall parachute for use in the Marine Corps. Author (GRA)

N77-33125# Universite des Sciences et Techniques de Lille (France).
TRANSIENT TURBULENT FLOW VISUALIZATION BY ULTRAFAST CHRONOPHOTOGRAPHY [ETUDE D'ECOULEMENTS TRANSSONIQUES TURBULENTS PAR CHRONOPHOTOGRAPHIE ULTRA-RAPIDE]
A. Dyment and P. Gryson Paris Assoc. Aeron. et Astronautique de France 1977 43 p refs In FRENCH Presented at the 13th Colloq. d'Aerodyn. Appl., Lyon, 8-10 Nov. 1976
(AAAF-NT-77-22; ISBN-2-7170-0439-4) Avail: NTIS HC A03/MF A01; CEDOCAR, Paris FF 29 (France and EEC) FF 29 (others)

The transonic flow in turbulence around various profiles was studied by chronophotography with an input flow velocity of 100 m/s and light flashes of 0.3 microsec deviation. The following situations were investigated: vortex generation, alternated wakes, flow around a plane wing, detachment at wing tip, wing profile with subsonic detached flow and with supercritical detached flow, high incidence air intake, instabilities, and bursts of turbulence. The various cases presented are compared with problems examined in the literature, for which a bibliography is given. ESA

N77-33126# Electricite de France, Chatou. Direction des Etudes et Recherches.
THREEDIMENSIONAL FLOW AROUND A FIXED TRANSVERSE CYLINDER [TRIDIMENSIONNALITE DE L'ECOULEMENT AUTOUR D'UN CYLINDRE IMMOBILE TRANSVERSAL]
P. Sonneville Paris Assoc. Aeron. et Astronautique de France 1977 37 p refs In FRENCH Presented at the 13th Colloq. d'Aerodyn. Appl., Lyon, 8-10 Nov. 1976
(AAAF-NT-77-19; ISBN-2-7170-0436-X) Avail: NTIS HC A03/MF A01; CEDOCAR, Paris FF 25 (France and EEC) FF 29 (others)

At Reynolds numbers around 40,000, the vortical detachment around a fixed circular transverse cylinder is no longer stable. A slow and gradual pressure variation appears at the cylinder's base and analogous variation of the fluctuation amplitude appear at the Strouhal frequency and its second harmonic. These low frequency modulations are not uniform along the cylinders length and there is longitudinal decorrelation. ESA

N77-33127# European Space Agency, Paris (France).
FUNDAMENTAL AERODYNAMIC STUDY OF LOCAL INJECTION IN A TURBULENT BOUNDARY LAYER
Joseph Prieur Sep. 1977 116 p refs Transl. into ENGLISH

of 'Etude Aerodyn. Fondamentale de l'Injection Localisee en Couche Limite Turbulente', ONERA, Paris Report ONERA-NT-1977-2, 1977 Original report in FRENCH previously announced as N77-30098
(ESA-TT-412; ONERA-NT-1977-2) Avail: NTIS HC A06/MF A01

The mixing zone between a jet and a turbulent boundary layer was studied, the injection being made by a two-dimensional slot, inclined with respect to the wall along which the boundary layer is developing. The hot wire technique was used to measure velocity, turbulence, and shear stress profiles. The longitudinal evolution of these profiles was studied. Slot width and injection angle were taken into account. Very important static pressure gradients are shown to exist in the injection region. A theoretical model of turbulence using two transport equations was developed and applied to the present study. The calculated profiles are in good agreement with measurements; they show the importance of streamline curvature effects on the structure of turbulence.
Author (ESA)

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

N77-33128*# Scientific Translation Service, Santa Barbara, Calif.
ANALYSIS OF AIR ACCIDENTS INVOLVING AIRPLANES OR HELICOPTERS OF VARIOUS TYPES OF APPLICATION
T. Kostia Washington NASA Aug. 1977 21 p refs Transl. into ENGLISH of Polish conf. paper Presented at Ergonomics in Aviat: 1st Natl. Sci. Technol. Conf., Warsaw, 17-19 May 1975 p 266-282 Original language document was announced as A76-28551
(Contract NASw-2791)
(NASA-TT-F-17443) Avail: NTIS HC A02/MF A01 CSCL 01C

The results are presented of a statistical analysis of air accidents involving two- and four-engine communications aircraft and general aviation aircraft up to 5.7 tons, with emphasis on agricultural aircraft, based on the whole on accident statistics published by the Civil Aeronautics Board. The occurrence rate of various kinds of accidents, involving fatalities or not, was calculated, the causes of the accidents are classified and some conclusions are drawn from the results regarding possible directions for future safer designs for general aviation aircraft.
Author

N77-33129*# Scientific Translation Service, Santa Barbara, Calif.
NOTES ON THE POLLUTION OF AIRPLANES AND HELICOPTERS BY CHEMICALS DURING AGRICULTURAL JOBS
Bernard Straszewski Washington NASA Aug. 1977 5 p Transl. into ENGLISH of Polish conf. paper Presented at Ergonomics in Aviat: 1st Natl. Sci. Technol. Conf., Warsaw, 17-19 Mar. 1975 p 326-328
(Contract NASw-2791)
(NASA-TT-F-17444) Avail: NTIS HC A02/MF A01 CSCL 01C

Contamination of the fuselage, the pilot's cabin, the engine, and the onboard compressed air installations while spraying agricultural fields is briefly discussed. Corrosion, service life, and exposure of the pilot and service personnel to toxic chemicals are among the factors considered.
J.M.S.

N77-33130*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A FLIGHT INVESTIGATION OF THE WAKE TURBULENCE ALLEVIATION RESULTING FROM A FLAP CONFIGURATION CHANGE ON A B-747 AIRCRAFT
Robert A. Jacobsen and Barbara J. Short Jul. 1977 45 p refs
(NASA-TM-73263; A-7116) Avail: NTIS HC A03/MF A01 CSCL 01C

A flight test investigation was conducted to evaluate the effects of a flap configuration change on the vortex wake characteristics of a Boeing 747 (B-747) aircraft as measured by differences in upset response resulting from deliberate vortex encounters by a following Learjet aircraft and by direct measurement of the velocities in the wake. The flaps of the B-747 have a predominant effect on the wake. The normal landing flap configuration produces a strong vortex that is attenuated when the outboard flap segments are raised; however, extension of the landing gear at that point increases the vortex induced upsets. These effects are in general agreement with existing wind tunnel and flight data for the modified flap configuration.
Author

N77-33131# National Aeronautical Lab., Bangalore (India). Information Centre for Aeronautics.
BIRD STRIKE HAZARDS: A BIBLIOGRAPHY, 1971 - 1976
H. S. S. Murthy, comp. Jun. 1977 22 p
(NAL-Bibl-Ser-77) Avail: NTIS HC A02/MF A01

A comprehensive collection of literature on aircraft bird strike hazards is presented. The entries are arranged into six groups: (1) literature survey; (2) bird ingestion; (3) environmental control; (4) laser techniques; (5) radar techniques; and (6) structural design. An author index is provided.
Author

N77-33132# ARA, Inc., West Covina, Calif.
INVESTIGATION OF AN ALUMINUM ROLLING HELIX CRASH ENERGY ABSORBER Final Report, Feb. - Dec. 1975
Bernard Mazelsky May 1977 36 p
(Contract DAAJ02-75-C-0015)
(AD-A042084; ARA-176; USAAMRDL-TR-77-8) Avail: NTIS HC A03/MF A01 CSCL 01/3

This report covers an investigation of various aluminum alloy wires suitable for a rolling helix energy absorber strut (TOR-SHOK) for use in crashworthy troop seats. Several aluminum alloy wire types were investigated to determine the linear stroking distance that the device could endure prior to the breaking of the helical wires, and to ascertain compatibility with the 6061-T6 aluminum tubes that are used as the struts to transmit the impact forces into the energy-absorbing helical wires. Once the wire was selected, several struts were fabricated and tested. In addition, two units were subjected to environmental tests, in accordance with Military Standard 810B, and were statically tested after the environmental tests. This study indicated that the most compatible aluminum wire to be used with the 6061-T6 aluminum tubing is the 5056-H38 series aluminum wire. The devices, after being subjected to the environmental tests, performed the same as those devices that were not subjected to the environmental tests. This was primarily a result of properly anodizing and sealing the aluminum tubing.
GRA

N77-33133# National Transportation Safety Board, Washington, D. C. Bureau of Accident Investigation.
AIRCRAFT ACCIDENT REPORT. MIDAIR COLLISION. REEDS AVIATION, INC., PIPER PA-28R-200, N7941C, AND PIPER-28-181, N8592C, NEAR HUNTSVILLE, MISSOURI, 24 JULY 1976
14 Apr. 1977 27 p
(NTISUB/C/104-002; NTSB-AAR-77-2) Avail: NTIS HC A03/MF A01; HC also available on subscription, $35.00 CSCL 01B

The failure of each pilot to maintain adequate vigilance was determined to be the probable cause of the midair collision of two Piper aircraft at 6,000 feet near Huntsville, Missouri. The pilot and two passengers aboard N7941C and the pilot and one passenger aboard N8592C were killed; both aircraft were destroyed. Piper N8592C, a private flight operating under instrument flight rules and under the control of Kansas City air route traffic control center, was en route from Urbana, Illinois, to Emporia, Kansas. Piper N7941C, an air taxi/charter flight operating under visual flight rules and without a flight plan, was climbing en route from Salisbury, Missouri, to the Chicago, Illinois, area.
GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N77-33134# Air Force Communications Service, Richards-Gebaur AFB, Mo.
SPECIAL EVALUATION REPORT ON TACAN PROPAGATION Final TRACALS Evaluation Report
Eugene P. Miller Jun. 1977 139 p refs
(AD-A041191; Rept-77/FFOT(S)-100) Avail: NTIS HC A07/MF A01 CSCL 17/7

This report provides a description of the propagation mechanisms which affect TACAN operation. The portion of the system from ground antenna through airborne flight inspection is treated. While much of the report is a compilation of classical references, a significant amount of discussion is provided on the results of the TRACALS Evaluation program. Some of these results are in the areas of computer prediction and coverage determination. General discussions of free space transmission, antenna characteristics, atmospheric propagation, surface and side reflections, and propagation variations are introduced with application to typical siting problems. Since all these qualities affect TACAN coverage, it is introduced last. Several problems are discussed with flight evaluation of TACAN coverage. These problems are illustrated through experimental data and involve uncertainties in the airborne system, refractive conditions, and flight procedures. A computer program is discussed in Section 10 that has application for future siting problems. It can be used as a basis for further research into the problems of side reflections and their effect on different aircraft receivers. The FAA method of predicting service volume and signal strength through the Institute of Telecommunications Sciences (ITS) computer programs is introduced and recommendations are made for AFCS adaptation of these programs. These programs would be useful in the planning stage for equipment configuration selection, the sitting process for determining service volume, and the evaluation stage for verifying operation. GRA

N77-33135# Calspan Corp., Buffalo, N. Y.
MULTIPATH AND PERFORMANCE TESTS OF TRSB RECEIVERS Interim Report, 1974 - Mar. 1977
J. Beneke, C. W. Wightman, C. B. Vallone, and A. M. Offt Mar. 1977 210 p refs
(Contract DOT-FA74WA-3445)
(AD-A041891; FAA-RD-77-66; CALSPAN-AG-5580-E-1) Avail: NTIS HC A10/MF A01 CSCL 17/7

A landing system simulation program has been carried out in support of the Microwave Landing System (MLS) program of the Federal Aviation Administration. Both scanning beam and doppler scan techniques were simulated and several angle processors were tested with each technique. This report contains the results of extensive simulation evaluations on the time reference scanning beam (TRSB) system. The results of the doppler simulation tests are published in the Calspan Technical notes referenced in this report. A representative set of multipath parameters was selected and used to explore the dynamic characteristics of the TRSB technique. Tests were run to determine the multipath error magnitude as a function of separation angle, amplitude, scalloping frequency and different processor parameters. These tests were conducted on a TRSB simulator that uses a computer to control the multipath parameters for each scan. Typical multipath scenarios were programed that represented the signals an aircraft would receive when flying through a multipath interference region. Some of the multipath scenarios used in the ICAO AWOP evaluations were simulated. The receivers used in the ICAO flight test program were evaluated in the simulator. A breadboard processor was developed that operates as a dwell gate processor, similar to the flight test receivers, or as a single edge processor (SEP) to evaluate the flare system. A closed loop simulation, including aircraft and autopilot characteristics, MLS signals with dynamic multipath characteristics and the MLS processor, was used to determine the aircraft perturbations resulting from hangar multipath reflections. GRA

N77-33136# Boeing Commercial Airplane Co., Seattle, Wash.
AIR TRAFFIC CONTROL EXPERIMENTATION AND EVALUATION TEST
S. G. Wilson, C. V. Paulson, and I. R. Reese Sep. 1976 157 p refs
(Contract DOT-TSC-707-6)
(AD-A041971; D6-44051; FAA-RD-75-173-6; FAA-76-22-6) Avail: NTIS HC A08/MF A01 CSCL 17/7

Results of performance evaluation of voice, digital data and ranging modems in the aeronautical satellite environment are given. Approximately 80 hours of modem performance data were acquired on board an FAA KC-135 jet aircraft operating over the North Atlantic. L-band test signals received at the aircraft were generated by ATS-6 satellite relay of transmissions from a NASA ground station. The modem evaluation tests were conducted between September 1974 and April 1975 as part of the U.S. Department of Transportation (DOT) aeronautical technology test program. The U.S. DOT tests were a component of the International ATS-6 L-Band Experiment coordinated by the NASA/Goddard Space Flight Center. Measured modem performance includes: the word intelligibility achieved by four distinct speech transmission modems; the average bit-error probability and error patterns associated with five phase-shift-keyed 1200-bps data modems; and the rms ranging accuracy achieved with two ranging modems. In each case the performance was evaluated as a function of carrier-to-noise density ratio (C/No) and direct-signal-to-multipath-signal ratio (S/I). Testing was performed with representative operational-class aircraft antennas as well as with special antennas, allowing the variation of the relative multipath level. GRA

N77-33137# Transportation Systems Center, Cambridge, Mass.
REQUIREMENTS FOR FLIGHT TESTING AUTOMATED TERMINAL SERVICE Interim Report
Joseph S. Dumas May 1977 39 p ref
(AD-A041975; TSC-FAA-77-3; FAA-AEM-77-6) Avail: NTIS HC A03/MF A01 CSCL 17/7

This report describes requirements for the flight tests of the baseline Automated Terminals Service (ATS) system. The overall objective of the flight test program is to evaluate the feasibility of the ATS concept. Within this objective there are two categories of specific ATS flight test objectives: (1) the objectives concerned with verifying the basic advisory capabilities of ATS and (2) the objectives concerned with evaluating pilots: responses to ATS messages. The flight testing is broken down into three parts. Part I will consist of system checkout flights. Part II will consist of validation and some pilot evaluation tests and will be conducted at NAFEC. Part III will consist primarily of normal airport operations at a selected general aviation airport. The requirements for the Part II and III evaluations of each of the ATS services to pilots are presented. For each service, there is a listing of the major issues involved in the evaluation and a discussion of the methods to be used in the evaluation. The description of the test methods for each service presents the type of missions that will be required, along with a table showing the measures to be taken and the sources of data where these measures can be most easily obtained. Author (GRA)

N77-33138# Air Force Avionics Lab., Wright-Patterson AFB, Ohio.
CONVERSION OF COMPUTER SOFTWARE FOR THE GIMBALLED ELECTROSTATIC GYRO NAVIGATION SYSTEM, VOLUME 1 Final Report, May 1973 - Dec. 1975
William Mikulski and William E. Shephard Feb. 1977 127 p refs
(AD-A041711; AFAL-TR-77-8-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 17/7

The Gimballed Electrostatic Gyro Navigation System (GEANS) conversion effort consisted of the conversion of an assembly language program for the Honeywell HDC-601 computer to another assembly language program for the Singer/Kearfott SKC-2000 computer. The HDC-601 and SKC-2000 were run in real time simultaneously. The SKC-2000 real time executive automatically synchronized with the HDC-601 so both programs ran in parallel, using the same input data from the Inertial

Measurement Unit (IUM). Alignment and Navigation output of both programs could then be compared and the SKC-2000 output verified. The conversion was completed successfully, the HDC-601 and SKC-2000 outputs agreeing to about 0.015 nautical miles per hour. Author (GRA)

N77-33139# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

GRAVITY MODELING FOR PRECISE TERRESTRIAL INERTIAL NAVIGATION

Robert M. Edwards Jun. 1977 157 p refs

(AD-A042419) Avail: NTIS HC A08/MF A01 CSCL 17/7

A historical perspective of gravity modeling for terrestrial navigation is presented. The traditional ellipsoidal model is explained, and the consequent errors are discussed. The propagation of these errors into navigation estimation errors is presented. A brief survey of advanced modeling methods and the pertinent theory is presented. The system design problem of selecting an advanced gravity model is presented as a scenario to motivate the proposed research. To address this problem, a new theoretical analysis technique is developed. This technique includes the effects of navigation error propagation, the statistics of the anomalous field (the residual after ellipsoidal or other reference field modeling), the statistics of gravity survey errors, and the advanced gravity modeling. These effects are combined to yield a measure of system performance cost as reflected in the navigation error state covariance due to gravity modeling errors acting alone. This report contains references to 82 items in the open literature pertinent to this subject area. Author (GRA)

N77-33140# Technische Universitaet, Brunswick (West Germany). Sonderforschungsbereich 58, Flugfuehrung.

MEASUREMENTS OF THE INFLUENCE OF STATIC AND DYNAMIC INTERFERENCE ON AN ILS-RECEIVER AND MEASUREMENT OF THE CAPTURE EFFECT WITH THE DOUBLE FREQUENCY PROCEDURE [MESSUNGEN DES EINFLUSSES STATISCHER UND DYNAMISCHER INTERFERENZ AUF EINEM ILS-EMPFAENGER UND MESSUNG DES CAPTURE-EFFEKTES BEI ZWEIFREQUENZVERFAHREN]

P. Form, R. Springer, and U. Stoldt Sep. 1976 25 p In GERMAN

(TUBS/SFB58/50) Avail: NTIS HC A02/MF A01

Static and dynamic interference of an onboard instrument landing system were investigated. The static interference tests show that the phase difference between effective and disturbance signal is the most important factor. Dynamic interference, caused by Doppler shift resulting from the moving aircraft, leads to an interchange of side bands and therefore of the information content. Measurement of the capture effect of the double frequency procedure showed that the disturbed signal can probably be suppressed to a large extent. ESA

N77-33141# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Dynamik der Flugsysteme.

THE APPLICATION OF THE KALMAN-BUCY FILTER THEORY TO THE DESIGN OF FEEDBACK NETWORKS FOR DOPPLER SUPPORTED INERTIAL NAVIGATION SYSTEMS IN FLIGHT [DIE ANWENDUNG DER KALMAN-BUCY-FILTERTHEORIE BEIM ENTWURF VON RUECKKOPPLUNGS-NETZWERKEN FUER DOPPLERGESTUETZTE TRAEGHEITS-NAVIGATIONSSYSTEME IM FLUGE]

W. Hofmann Feb. 1976 62 p refs In GERMAN

(DLR-IB-552-75/18) Avail: NTIS HC A04/MF A01

Application of the theory to the design of navigation filters for the estimation of the platform failure angle and to the design of feedback networks for the alignment of a Doppler supported inertia navigation system (INS) in flight was investigated. A failure model of the Doppler supported INS was drawn up and its command and observation capabilities were analyzed. A possible procedure for the design of optimal (Kalman-Bucy) and suboptimal navigation filters is given. Static and dynamic feedback networks were developed and their failure behavior investigated. The design procedure proposed is optimal in the sense of smallest stationary standard deviations. ESA

N77-33142# European Space Agency, Paris (France).

MONTE CARLO SIMULATION OF VOR/DME HOLDING PROCEDURES. BASIC NOTIONS AND APPLICATIONS

Holger Schnuerer Sep. 1977 29 p refs Transl. into ENGLISH of 'Grundlagen u. Anwend. der Simulation von VOR/DME-Warteverfahren mit der Monte-Carlo-Tech.', DFVLR, Brunswick Report DLR-FB-77-08, 17 Mar. 1977 Original report in GERMAN previously announced as N77-30105 Original German report available from DFVLR, Cologne DM 13.70

(ESA-TT-419; DLR-FB-77-08) Avail: NTIS HC A03/MF A01

Using DME in addition to VOR allows a better use of the airspace for holding procedures in civil aviation. As yet, there are no procedures agreed on by the international authorities for the construction of the airspace to be reserved for a safe execution of these holding procedures. A method for the construction of holding areas of different probabilities is described in which the simulation of flight paths in a computer using the Monte Carlo technique has special importance. The simulation allows the application of an extensive and detailed error model. In addition, the locally different physical conditions may be taken into consideration. Both factors are most important for safe and economical use of airspace. Author (ESA)

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N77-33143# Sikorsky Aircraft, Stratford, Conn.

PERFORMANCE FLIGHT TESTS OF THE RH-53D DESIGN GROWTH CONFIGURATION

J. McCauley 4 Nov. 1976 215 p refs

(Contract N00019-74-C-0183)

(SER-651316) Avail: NTIS HC A10/MF A01

Performance of the RH-53D design growth configuration (DGC) helicopter was evaluated during hover, level flight, forward climb, and dynamic tow. Test results demonstrate significant improvements in aircraft performance when compared with the standard RH-53D. The RH-53D (DGC) achieved out of ground effect hover at a gross weight of 50,000 pounds. Level flight tests showed an improved capability during heavy weight level flight and indicated the ability of the RH-53D (DGC) to maintain level flight at 50,000 pounds with one engine inoperative. Dynamic tow tests demonstrated the ability of the helicopter to safely accomplish the tow mission with a significant margin of available power remaining. Author

N77-33144# Sikorsky Aircraft, Stratford, Conn.

HANDLING QUALITIES OF THE RH-53D IN THE DESIGN GROWTH CONFIGURATION

L. Bajorinas and P. Griswold 11 Oct. 1976 226 p refs

(Contract N00019-74-C-0183)

(SER-651317) Avail: NTIS HC A11/MF A01

A flying qualities flight test program was conducted on the RH-53D in the Design Growth Configuration which included use of improved rotor blades, T64-Ge-415 engine ratings, and increased drive train input horsepower (8660). Sideward flight characteristics, control power and control margins, dynamic stability, maneuver stability and response equivalent to external disturbance were investigated as well as engine-out characteristics in static tow, at altitude, and near the surface. Tests were made at 42,000 lbs and the design alternate gross weight of 50,000 lbs. No significant differences between the handling qualities of a production RH-53D and one in the Design Growth Configuration were found, and no flight control rigging or AFCS gain changes were required. The maximum flyaway gross weight following a single engine power loss during tow was increased. The height-velocity characteristics at 50,000 lbs G.W. were improved over those at 42,000 lbs in production RH-53D configuration. Author

N77-33145*# Joint Inst. for Advancement of Flight Sciences, Hampton, Va.

A QUALITATIVE ASSESSMENT OF A RANDOM PROCESS PROPOSED AS AN ATMOSPHERIC TURBULENCE MODEL

Kenneth Sidwell Sep. 1977 76 p refs
(Grant NGR-09-010-078)
(NASA-CR-145247) Avail: NTIS HC A05/MF A01 CSCL 01C

A random process is formed by the product of two Gaussian processes and the sum of that product with a third Gaussian process. The resulting total random process is interpreted as the sum of an amplitude modulated process and a slowly varying, random mean value. The properties of the process are examined, including an interpretation of the process in terms of the physical structure of atmospheric motions. The inclusion of the mean value variation gives an improved representation of the properties of atmospheric motions, since the resulting process can account for the differences in the statistical properties of atmospheric velocity components and their gradients. The application of the process to atmospheric turbulence problems, including the response of aircraft dynamic systems, is examined. The effects of the mean value variation upon aircraft loads are small in most cases, but can be important in the measurement and interpretation of atmospheric turbulence data. Author

N77-33146*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

AN ELEMENTARY ANALYSIS OF THE EFFECT OF SWEEP, MACH NUMBER, AND LIFT COEFFICIENT ON WING-STRUCTURE WEIGHT

Albert C. Kyser Sep. 1977 31 p ref
(NASA-TM-74072) Avail: NTIS HC A03/MF A01 CSCL 01C

Results are presented from an elementary analysis of the effect of sweep angle on the idealized structural weight of swept wings, with cruise Mach number M and lift coefficient C sub L as parameters. The analysis indicates that sweep is unnecessary for cruise Mach numbers below about 0.80, whereas for the higher subsonic speeds, a well defined minimum-weight condition exists at a sweep angle in the neighborhood of 35 deg or 40 deg, depending on M and C sub L. The results further indicate that wing-structure weight increases sharply with Mach number in the high subsonic range, with Mach 0.85 wings weighing half again as much as Mach 0.75 wings. Weight is also shown to increase with cruise lift coefficient, but the effect is not strong for the usual range of design lift coefficients. Minimum wing-structure weight is found to occur at a ratio of thickness to normal chord of about 18 percent, but it is concluded that the thickness ratio for optimum wing design would probably lie in the range of 12 to 15 percent. Author

N77-33147*# Boeing Commercial Airplane Co., Seattle, Wash. Preliminary Design Dept.

TECHNICAL AND ECONOMIC ASSESSMENT OF SWEPT-WING SPAN-DISTRIBUTED LOAD CONCEPTS FOR CIVIL AND MILITARY AIR CARGO TRANSPORTS

Oct. 1977 152 p refs
(Contract NAS1-14667)
(NASA-CR-145229; D6-45159) Avail: NTIS HC A08/MF A01 CSCL 01C

The feasibility of large freighter aircraft was assessed, including the impact of military requirements on the performance, economics, and fuel consumption characteristics. Only configurations having net payloads of 272,155 to 544,311 kilograms contained within swept wings of constant chord were studied. These configurations were of advanced composite construction with controllable winglets and full-span digitally-controlled trailing-edge surfaces. Civil, military, and joint civil/military production programs were considered. Author

N77-33148*# Virginia Univ., Charlottesville. Dept. of Engineering Science and Systems.

THE DEVELOPMENT OF A MODEL FOR PREDICTING PASSENGER ACCEPTANCE OF SHORT-HAUL AIR TRANSPORTATION SYSTEMS

A. Robert Kuhlthau and Ira D. Jacobson Sep. 1977 59 p
(Grant NGR-47-005-181)
(NASA-CR-145250; UVA/528060/ESS77/111) Avail: NTIS HC A04/MF A01 CSCL 01C

Meaningful criteria and methodology for assessing, particularly in the area of ride quality, the potential acceptability to the traveling public of present and future transportation systems were investigated. Ride quality was found to be one of the important variables affecting the decision of users of air transportation, and to be influenced by several environmental factors, especially motion, noise, pressure, temperature, and seating. Models were developed to quantify the relationship of subjective comfort to all of these parameters and then were exercised for a variety of situations. Passenger satisfaction was found to be strongly related to ride quality and was so modeled. A computer program was developed to assess the comfort and satisfaction levels of passengers on aircraft subjected to arbitrary flight profiles over arbitrary terrain. A model was deduced of the manner in which passengers integrate isolated segments of a flight to obtain an overall trip comfort rating. A method was established for assessing the influence of other links (e.g., access, terminal conditions) in the overall passenger trip. Author

N77-33149*# Douglas Aircraft Co., Inc., Long Beach, Calif.

MODELING AND PARAMETER UNCERTAINTIES FOR AIRCRAFT FLIGHT CONTROL SYSTEM DESIGN Final Report

J. D. McDonnell, R. A. Berg, R. M. Heimbaugh, and C. A. Felton Washington NASA Sep. 1977 132 p refs
(Contract NAS1-14151)
(NASA-CR-2887; MDC-J4555) Avail: NTIS HC A07/MF A01 CSCL 01C

Values of plant dynamic uncertainties for some recent aircraft design and development programs are given. Histories of pertinent aerodynamic, inertial, and structural parameter variations are given for a period of time from program initiation to aircraft certification. These data can be used as typical of future vehicles so that control system design concepts are evaluated with due consideration to their sensitivity to uncertainties in plant dynamics. Author

N77-33150*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

BEHAVIOR OF AIRCRAFT ANTISKID BREAKING SYSTEMS ON DRY AND WET RUNWAY SURFACES: A SLIP-RATIO-CONTROLLED SYSTEM WITH GROUND SPEED REFERENCE FROM UNBRAKED NOSE WHEEL

John A. Tanner and Sandy M. Stubbs Washington Oct. 1977 167 p refs
(NASA-TN-D-8455; L-11292) Avail: NTIS HC A08/MF A01 CSCL 01C

An experimental investigation was conducted at the Langley aircraft landing loads and traction facility to study the braking and cornering response of a slip ratio controlled aircraft antiskid braking system with ground speed reference derived from an unbraked nose wheel. The investigation, conducted on dry and wet runway surfaces, utilized one main gear wheel, brake, and tire assembly of a DC-9 series 10 airplane. During maximum braking, the average ratio of the drag force friction coefficient developed by the antiskid system to the maximum drag force friction coefficient available was higher on the dry surface than on damp and flooded surfaces, and was reduced with lighter vertical loads, higher yaw angles, and when new tire treads were replaced by worn treads. Similarly, the average ratio of side force friction coefficient developed by the tire under antiskid control to the maximum side force friction coefficient available to a freely rolling yawed tire decreased with increasing yaw angle, generally increased with ground speed, and decreased when tires with new treads were replaced by those with worn treads. Author

N77-33151*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

LONGITUDINAL HANDLING QUALITIES DURING APPROACH AND LANDING OF A POWERED LIFT STOL AIRCRAFT

James A. Franklin and Robert C. Innis Mar. 1972 68 p refs
(NASA-TM-X-62144) Avail: NTIS HC A04/MF A01 CSCL 01C

Longitudinal handling qualities evaluations were conducted on the Ames Research Center Flight Simulator for Advanced Aircraft (FSAA) for the approach and landing tasks of a powered lift STOL research aircraft. The test vehicle was a C-8A aircraft modified with a new wing incorporating internal blowing over

an augmentor flap. The investigation included: (1) use of various flight path and airspeed control techniques for the basic vehicle; (2) assessment of stability and command augmentation schemes for pitch attitude and airspeed control; (3) determination of the influence of longitudinal and vertical force coupling for the power control; (4) determination of the influence of pitch axis coupling with the thrust vector control; and (5) evaluations of the contribution of stability and command augmentation to recovery from a single engine failure. Results are presented in the form of pilot ratings and commentary substantiated by landing approach time histories. Author

N77-33152# Rockwell International Corp., Columbus, Ohio. Columbus Aircraft Div.

EVALUATION OF COMPOSITE WING FOR XFV-12A AIRPLANE Final Report, 28 Jun. 1974 - 31 Aug. 1976

D. N. Ulry, R. W. Gehring, and K. I. Clayton Dec. 1976 320 p

(Contract N62269-74-C-0577)

(AD-A041208; NR76H-135; NADC-77183-30) Avail: NTIS HC A14/MF A01 CSCL 11/4

A prior study conducted for the Naval Air Systems Command for application of advanced composites in the XFV-12A aircraft indicated the wing torque box to be the component of airframe structure having the greatest potential for significant weight savings through composite material application. A Phase II design/development program was undertaken to develop detail design concepts for a XFV-12A composite wing box and fabricate a representative section of this wing box for development test and evaluation to provide a base for subsequent Phase III full scale verification testing. GRA

N77-33153# Naval Postgraduate School, Monterey, Calif.

HUMAN FACTORS ENGINEERING CONSIDERATIONS IN DESIGNING NAVAL AIRCRAFT FOR MAINTAINABILITY

William Edward Baumgartner Jun. 1977 109 p refs

(AD-A041156) Avail: NTIS HC A06/MF A01 CSCL 01/3

Rising maintenance costs and the necessity for increased availability have resulted in a new emphasis on maintainability as a design parameter in the acquisition of Naval air systems. Human factors engineering, traditionally considered a means of improving operator performance, is also a designer's tool for improving aircraft maintainability. Department of Defense directives mandating that all systems be designed according to specific human factors engineering and maintainability criteria confirm the necessity for including the human engineer in the designing of aircraft for maintainability. Appendix A, 'The Checklist for Human Factors Engineering of Maintainability in Naval Air Systems Design,' has been developed as a tool for aircraft designers and Navy design monitors to ensure human factoring criteria have been incorporated in the maintainability of the major aircraft subsystems. Author (GRA)

N77-33154# RAND Corp., Santa Monica, Calif.

AN EVALUATION OF VERY LARGE AIRPLANES AND ALTERNATIVE FUELS: EXECUTIVE SUMMARY Interim Report

W. T. Mikolowsky Dec. 1976 41 p refs

(Contract F49620-77-C-0023)

(AD-A042112; R-1889/1-AF) Avail: NTIS HC A03/MF A01 CSCL 21/4

Candidate applications of very large airplanes include: strategic airlifter, tanker, missile launcher, tactical battle platform, maritime air cruiser, and C3 platform. This report summarizes AD-A040532 which explored the military utility of very large airplanes (over 1 million pounds gross weight) and examined several alternative fuels that could be used by such airplanes. GRA

N77-33155# Army Air Mobility Research and Development Lab., Fort Eustis, Va. Research and Development Lab.

AN ASSESSMENT OF THE HOVER PERFORMANCE OF THE XH-59A ADVANCING BLADE CONCEPT DEMONSTRATION HELICOPTER

Donald N. Arents May 1977 19 p refs

(DA Proj. 1L2-6311-D-157)

(AD-A042063; USBAMRDL-TN-25) Avail: NTIS HC A02/MF A01 CSCL 01/3

This report documents a study of the hovering characteristics the XH-59A helicopter, which was built to demonstrate the feasibility of the Advancing Blade Concept (ABC). The study examined in- and out-of-ground hover characteristics, aircraft and rotor figures of merit, and hover performance at 10- and 20-foot wheel heights. The XH-59A's performance is also compared to the performances of other Army helicopters. This indicates that the XH-59A performs better than other helicopters, largely because it lacks a tail rotor. GRA

N77-33156# Cessna Aircraft Co., Wichita, Kans. Wallace Div.

A-37B FATIGUE SENSOR EVALUATION PROGRAM: FULL SCALE TEST AND FIELD AIRCRAFT INSTRUMENTATION Final Report, Jul. 1971 - Jan. 1976

Robert W. Walker and John Y. Kaufman Mar. 1977 123 p refs

(Contract F33657-71-C-0163)

(AD-A042114; ASD-TR-77-4) Avail: NTIS HC A06/MF A01 CSCL 01/3

Micro Measurements FM Fatigue Sensors were installed on A-37 aircraft at three CONUS bases to determine the longevity and suitability of this device for field installation. A similar installation on an A-37B full scale fatigue test provided base line data for relative severity comparisons of accumulated fatigue. The sensor is shown to be practical for field installation and this report recommends field installations designed for more advanced data analysis methods. Author (GRA)

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N77-33157*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

A SUSPENDED ANEMOMETER SYSTEM FOR MEASURING TRUE AIRSPEED ON LOW-SPEED AIRPLANES

David D. Kershner Oct. 1977 30 p refs

(NASA-TN-D-8523; L-11269) Avail: NTIS HC A02/MF A01 CSCL 01D

A suspended anemometer system for calibrating pitot-static systems on low speed research airplanes is described. The anemometer measures true airspeed when suspended beneath the airplane on a long cable in regions of undisturbed air. The electrical output of the propeller driven tachometer is a sine wave, the frequency of which is proportional to true airspeed. The anemometer measures true airspeed over a range from 20 to 60 m/sec at altitudes to 3000 m, with an accuracy of + or - 0.5 percent of full scale range. This accuracy is exclusive of errors in the recording system. The stability of the suspended system was investigated and was found adequate in the airspeed range. For the purpose of determining the location of the anemometer relative to the airplane, a method is given for calculating the shape assumed by the deployed cable. Author

N77-33158# Grumman Aerospace Corp., Bethpage, N.Y. Power Optics and Displays Dept.

MASTER MONITOR DISPLAY APPLICATION STUDY FOR F-14 Final Report

Joseph Austin 25 Mar. 1977 157 p

(Contract N62269-76-C-0199)

(AD-A041570; NADC-77076-30) Avail: NTIS HC A08/MF A01 CSCL 09/5

This Report summarizes the results of a study to replace the existing Caution Advisory Indicator in the F-14 with a Master Monitor Display (MMD). An MMD is described which uses the existing F-14 fault sensors with a few additions, and with several minor modifications to the aircraft interface. The MMD design features 'management by exception', and provides automatic display of fault and course of action information on a cathode ray tube readout for all detected faults. It also provides for

manual display of total systems status, system fault, and fault history information on a call up basis. Author (GRA)

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N77-33159*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

PROGRESS IN ADVANCED HIGH TEMPERATURE TURBINE MATERIALS, COATINGS, AND TECHNOLOGY

John C. Freche and G. Mervin Ault 23 Sep. 1977 44 p refs Presented at the 50th Panel on Propulsion and Energetics, Ankara, 19-23 Sep. 1977; sponsored by AGARD

(NASA-TM-X-73628) Avail: NTIS HC A03/MF A01 CSCL 21E

Material categories as well as coatings and recent turbine cooling developments are reviewed. Current state of the art is identified, and as assessment, when appropriate, of progress, problems, and future directions is provided. Author

N77-33160*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

STEADY-STATE UNBALANCE RESPONSE OF A THREE-DISK FLEXIBLE ROTOR ON FLEXIBLE, DAMPED SUPPORTS

Robert E. Cunningham 29 Sep. 1977 42 p refs Presented at the Vibrations Conf., Chicago, 26-29 Sep. 1977; sponsored by ASME

(NASA-TM-X-73666; E-9091-1) Avail: NTIS HC A03/MF A01 CSCL 21E

Experimental data are presented for the unbalance response of a flexible, ball bearing supported rotor to speeds above the third lateral bending critical. Values of squeeze film damping coefficients obtained from measured data are compared to theoretical values obtained from short bearing approximation over a frequency range from 5000 to 31000 cycles/min. Experimental response for an undamped rotor is compared to that of one having oil squeeze film dampers at the bearings. Unbalance applied varied from 0.62 to 15.1 gm-cm. Author

N77-33161*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

OVER-THE-WING MODEL THRUST REVERSER NOISE TESTS

J. Goodykoontz and O. Gutierrez 5 Oct. 1977 20 p refs Presented at the 4th Aeroacoustics Conf., Atlanta, 3-5 Oct. 1977; sponsored by AIAA

(NASA-TM-73495; E-9328) Avail: NTIS HC A02/MF A01 CSCL 20A

Static acoustic tests were conducted on a 1/12 scale model over-the-wing target type thrust reverser. The model configuration simulates a design that is applicable to the over-the-wing short-haul advanced technology engine. Aerodynamic screening tests of a variety of reverser designs identified configurations that satisfied a reverse thrust requirement of 35 percent of forward thrust at a nozzle pressure ratio of 1.29. The variations in the reverser configuration included, blocker door angle, blocker door lip angle and shape, and side skirt shape. Acoustic data are presented and compared for the various configurations. The model data scaled to a single full size engine show that peak free field perceived noise (PN) levels at a 152.4 meter sideline distance range from 98 to 104 PNdb. Author

N77-33162*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

IDENTIFICATION AND MEASUREMENT OF COMBUSTION NOISE FROM A TURBOFAN ENGINE USING CORRELATION AND COHERENCE TECHNIQUES Ph.D. Thesis

Allen Martin Karchmer Sep. 1977 156 p refs

(NASA-TM-73747; E-9319) Avail: NTIS HC A08/MF A01 CSCL 20A

Fluctuating pressure measurements within the combustor and tailpipe of a turbofan engine are made simultaneously with far field acoustic measurements. The pressure measurements within the engine are accomplished with cooled semi-infinite waveguide probes utilizing conventional condenser microphones as the transducers. The measurements are taken over a broad range of engine operating conditions and for 16 far field microphone positions between 10 deg and 160 deg relative to the engine inlet axis. Correlation and coherence techniques are used to determine the relative phase and amplitude relationships between the internal pressures and far field acoustic pressures. The results indicate that the combustor is a low frequency source region for acoustic propagation through the tailpipe and out to the far field. Specifically, it is found that the relation between source pressure and the resulting sound pressure involves a 180 deg phase shift. The latter result is obtained by Fourier transforming the cross correlation function between the source pressure and acoustic pressure after removing the propagation delay time. Further, it is found that the transfer function between the source pressure and acoustic pressure has a magnitude approximately proportional to frequency squared. These results are shown to be consistent with a model using a modified source term in Lighthill's turbulence stress tensor, wherein the fluctuating Reynolds stresses are replaced with the pressure fluctuations due to fluctuating entropy. Author

N77-33163*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

MEASUREMENT OF FAR FIELD COMBUSTION NOISE FROM A TURBOFAN ENGINE USING COHERENCE FUNCTIONS

A. M. Karchmer, M. Reshotko, and F. J. Montegani 5 Oct. 1977 33 p refs Presented at 4th Aeroacoustics Conf., Atlanta, 3-5 Oct. 1977; sponsored by AIAA

(NASA-TM-73748; E-9320; AIAA-Paper-77-1277) Avail: NTIS HC A03/MF A01 CSCL 21E

Coherence measurements between fluctuating pressure in the combustor of a YF-102 turbofan engine and far-field acoustic pressure were made. The results indicated that a coherent relationship between the combustor pressure and far-field existed only at frequencies below 250 Hz, with the peak occurring near 125 Hz. The coherence functions and the far-field spectra were used to compute the combustor-associated far-field noise in terms of spectra, directivity, and acoustic power, over a range of engine operating conditions. The acoustic results so measured were compared with results obtained by conventional methods, as well as with various semiempirical predictions schemes. Examination of the directivity patterns indicated a peak in the combustion noise near 120 deg (relative to the inlet axis). Author

N77-33164*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

IMPROVED COMPUTER PROGRAMS FOR CALCULATING POTENTIAL FLOW IN PROPULSION SYSTEM INLETS

Norbert O. Stockman and Charles A. Farrell, Jr. Jul. 1977 430 p refs

(NASA-TM-73728; E-9285) Avail: NTIS HC A19/MF A01 CSCL 21E

Computer programs to calculate the incompressible potential flow corrected for compressibility in axisymmetric inlets at arbitrary operating conditions are presented. Included are a statement of the problem to be solved, a description of each of the programs and sufficient documentation, including a test case, to enable a user to run the programs. Author

N77-33165*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

OUTPUT FEEDBACK REGULATOR DESIGN FOR JET ENGINE CONTROL SYSTEMS

Walter Merrill 1977 14 p refs Presented at Intern. Forum on Alternatives for Linear Multivariable Control, Chicago, 13-14 Oct. 1977; sponsored by Natl. Elec. Conf.

(NASA-TM-73776) Avail: NTIS HC A02/MF A01 CSCL 21E

A multivariable control design procedure based on the output feedback regulator formulation is described and applied to turbofan

engine model. Full order model dynamics, were incorporated in the example design. The effect of actuator dynamics on closed loop performance was investigaged. Also, the importance of turbine inlet temperature as an element of the dynamic feedback was studied. Step responses were given to indicate the improvement in system performance with this control. Calculation times for all experiments are given in CPU seconds for comparison purposes. Author

N77-33166*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STATE-OF-THE-ART OF TURBOFAN ENGINE NOISE CONTROL
W. L. Jones and J. F. Groeneweg Oct. 1977 22 p refs Presented at NOISE-CON 77, Hampton, Va., 17-19 Oct. 1977; cosponsored by Inst. of Noise Control Eng.
(NASA-TM-73734; E-9254) Avail: NTIS HC A02/MF A01 CSCL 21E

The technology of turbofan engine noise reduction is surveyed. Specific topics discussed include: (1) new fans for low noise; (2) fan and core noise suppression; (3) turbomachinery noise sources; and (4) a new program for improving static noise testing of fans and engines. Author

N77-33167*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MINIMUM TIME ACCELERATION OF AIRCRAFT TURBOFAN ENGINES BY USING AN ALGORITHM BASED ON NONLINEAR PROGRAMMING
Fred Teren Jul. 1977 182 p refs
(NASA-TM-73741) Avail: NTIS HC A09/MF A01 CSCL 21E

Minimum time accelerations of aircraft turbofan engines are presented. The calculation of these accelerations was made by using a piecewise linear engine model, and an algorithm based on nonlinear programming. Use of this model and algorithm allows such trajectories to be readily calculated on a digital computer with a minimal expenditure of computer time. Author

N77-33168*# AiResearch Mfg. Co., Phoenix, Ariz.
POLLUTION REDUCTION TECHNOLOGY PROGRAM FOR SMALL JET AIRCRAFT ENGINES, PHASE 1 Final Report, Nov. 1974 - Jun. 1976
T. W. Bruce, F. G. Davis, T. E. Kuhn, and H. C. Mongia Sep. 1977 177 p refs
(Contract NAS3-18560)
(NASA-CR-135214; AiResearch-21-2498) Avail: NTIS HC A09/MF A01 CSCL 21E

A series of combustor pressure rig screening tests was conducted on three combustor concepts applied to the TFE731-2 turbofan engine combustion system for the purpose of evaluating their relative emissions reduction potential consistent with prescribed performance, durability, and envelope contraints. The three concepts and their modifications represented increasing potential for reducing emission levels with the penalty of increased hardware complexity and operational risk. Concept 1 entailed advanced modifications to the present production TFE731-2 combustion system. Concept 2 was based on the incorporation of an axial air-assisted airblast fuel injection system. Concept 3 was a staged premix/prevaporizing combustion system. Significant emissions reductions were achieved in all three concepts, consistent with acceptable combustion system performance. Concepts 2 and 3 were identified as having the greatest achievable emissions reduction potential, and were selected to undergo refinement to prepare for ultimate incorporation within an engine. Author

N77-33169*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
F100 MULTIVARIABLE CONTROL SYNTHESIS PROGRAM: EVALUATION OF A MULTIVARIABLE CONTROL USING A REAL-TIME ENGINE SIMULATION
John R. Szuch, James F. Soeder, Kurt Seldner, and David S. Cwynar Oct. 1977 103 p refs
(NASA-TP-1056; E-9170) Avail: NTIS HC A06/MF A01 CSCL 21E

The design, evaluation, and testing of a practical, multivariable, linear quadratic regulator control for the F100 turbofan engine were accomplished. NASA evaluation of the multivariable control logic and implementation are covered. The evaluation utilized a real time, hybrid computer simulation of the engine. Results of the evaluation are presented, and recommendations concerning future engine testing of the control are made. Results indicated that the engine testing of the control should be conducted as planned. Author

N77-33170# TRW, Inc., Cleveland, Ohio. Materials Technology.
AIR BONDED, FOD RESISTANT METAL MATRIX FAN BLADES Final Report, 20 Jun. 1975 - 30 Jul. 1976
Gordon S. Doble and Paul Melnyk Sep. 1976 134 p refs
(Contract F33615-75-C-5222; AF Proj. 7351)
(AD-A041492; ER-7850-2; AFML-TR-76-218) Avail: NTIS HC A07/MF A01 CSCL 13/8

A low cost air bonding process was developed for the fabrication of boron-aluminum fan blades from monotapes. Boron-aluminum systems of 8 mil boron-1100, 1100/2024 hybrid, and 6061 aluminum were successfully air bonded with properties equivalent to higher cost vacuum bonded material. The 8 mil boron-1100 system was selected for property characterization because of high Charpy energy absorption, 46 foot + lbs in + or - 15 deg orientation. The mechanical properties were compared to design requirements analytically determined for an advanced first stage fan blade, the J-101. GRA

N77-33171# AiResearch Mfg. Co., Torrance, Calif.
SUBSYSTEM DESIGN ANALYSIS LIGHT WEIGHT ALTERNATOR (MODEL TEST PROGRAM). ADDENDUM 2 Final Report
C. H. Lee, D. Berker, G. Tatro, and P. Walia Mar. 1977 105 p
(Contract F29601-74-C-0055)
(AD-A041257; AFWL-TR-75-66-Add-2) Avail: NTIS HC A06/MF A01 CSCL 10/2

This report discusses the test and computer simulation activities conducted on a modified-design, small-rating aircraft alternator. These activities were intended to provide additional verifications of the alternator analytical approach utilized in designing two specialized large-rating lightweight alternators. The latter designs have been previously detailed in Air Force technical reports AFWL-TR-75-66, Subsystem Design Analysis Report for Lightweight Alternator (AC Load Case), and AFWL-TR-75-66, Addendum 1, Subsystem Design Analysis Report for Lightweight Alternator (DC Load Case). Author (GRA)

N77-33172# Aeronautical Research Council, London (England).
THE CURRENT STATE OF RESEARCH AND DESIGN IN HIGH PRESSURE RATIO CENTRIFUGAL COMPRESSORS
P. M. Came Jul. 1976 75 p refs Supersedes NGTE-NT-1029
(AD-A041011; ARC-CP-1363; NGTE-NT-1029) Avail: NTIS HC A04/MF A01 CSCL 21/5

A review of the achievements of research effort in centrifugal compressors is presented and its effect on current design methods is discussed. The paper concludes with recommendations for future research. Author (GRA)

N77-33173# United Technologies Research Center, East Hartford, Conn.
DEVELOPMENT OF A THREE-DIMENSIONAL COMBUSTOR FLOW ANALYSIS. VOLUME 3: USER'S MANUAL FOR THE MINT COMPUTER CODE Final Report, 1 Mar. 1974 - 1 Oct. 1976
Howard J. Gibeling 1 Oct. 1976 90 p
(Contract F33615-74-C-2028)
(AD-A041351; AFAPL-TR-75-59-Vol-3) Avail: NTIS HC A05/MF A01 CSCL 09/2

A three-dimensional computational procedure was developed for calculating the coupled flow and chemistry within rectangular or axisymmetric combustors with a discrete circumferential distribution of injection ports. The compressible time-averaged Navier-Stokes equations are solved with coupled pseudo-kinetic hydrocarbon chemistry including the effects of turbulence, droplet vaporization and burning, and radiation transport. A two-equation turbulence transport model utilizing the turbulence kinetic energy and its dissipation rate is employed via the Prandtl- Kolmogorov

hypothesis to determine the turbulent viscosity. The governing equations are solved using the Multidimensional Implict Nonlinear Time-dependent Mint procedure, which employs a unique linearization technique and a Douglas-Gunn alternating-direction-implicit (ADI) scheme. Calculations were made for the flow in a rectangular combustion chamber with a discrete distribution of inlet injection ports. The theoretical analysis and results pertaining to the present study are described in detail in Volumes I and II of the present report. This user's manual provides a general description of the main features of the computer program along with a description of the input variables and a summary of the printed output. Author (GRA)

N77-33174# Purdue Univ., Lafayette, Ind. Thermal Sciences and Propulsion Center.

PROPULSION NOZZLE STUDIES. VOLUME 2: DESIGN OF MAXIMUM THRUST NOZZLE-BASE-BOATTAIL CONTOURS Final Report, Sep. 1972 - May 1976

Jeffrey G. Allman and Joe D. Hoffman Mar. 1977 122 p refs

(Contract F33615-73-C-2010)

(AD-A041530; AFAPL-TR-77-1-Vol-2) Avail: NTIS HC A06/MF A01 CSCL 09/2

A production-type computer program was developed for the design of maximum thrust axisymmetric nozzle-base-boattail contours. The flow field analysis is based on the governing equations for the rotational flow of a frozen or equilibrium gas mixture. The contour optimization is based on the direct optimization of a nonlinear function of several (three or less) geometric variables. The nozzle and boattail contours are modeled as a second-order polynomial and a cone, respectively. For fixed initial contours and nozzle and boattail lengths, the second-order polynomial nozzle contour is uniquely specified by the nozzle throat attachment angle and the nozzle exit lip radius, and the conical boattail is uniquely specified by the boattail exit lip radius. These three independent parameters are varied to determine the unique nozzle-base-boattail configuration that yields maximum thrust. Three methods are included in the program to determine the maximum thrust contour. Each method requires an initial estimate of the geometry that produces maximum thrust. The three methods were also applied to the design of nozzle-base-boattail configurations. The three-dimensional optimizations were found to be practical for finding the maximum thrust attainable for a nozzle-base-boattail assembly. Each of the three methods converged efficiently to the maximum thrust nozzle-base-boattail contour. GRA

N77-33175# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.

HIGH VELOCITY JET NOISE SOURCE LOCATION AND REDUCTION. TASK 4: DEVELOPMENT/EVALUATION OF TECHNIQUES FOR INFLIGHT INVESTIGATION Final Report

W. S. Clapper and E. J. Stringas 22 Feb. 1977 569 p refs (Contract DOT-OST-30034)

(AD-A041849; Rept-R77AEG189; FAA-RD-76-79-4) Avail: NTIS HC A24/MF A01 CSCL 20/1

This report presents the results of Task 4 as conducted under the subject program over a period of 30 months. Task 4 was formulated to identify and evaluate several inflight simulation techniques, select the most promising technique for demonstration and validation, and employ that technique in testing under Task 5 of the program. Techniques evaluated include closed-circuit wind tunnels, free jets, rocket sleds, and high speed trains. Pertinent results from the evaluation phase and rationale which led to selection of the free jet simulation technique are discussed, including advantages and disadvantages. The results of a theoretical study aimed at relating the noise signature obtained in a free jet facility for simulation of forward flight effects on jet noise with the noise signature in true flight are presented. Transformation is carried out by extracting 'static directivity' of the noise after correcting for refraction, turbulent scattering, and absorption effects, and then employing a suitable multipole source decomposition to evaluate the proper dynamic effect. A flowchart describing the details of the transformation procedure and a listing of the computer program are included. Acoustic results from the Learjet and NASA-Lewis F-106 Aircraft Flyovers and the French Aerotrain Tests, taken with a baseline, 8-lobe, and 104-tube nozzle were used to formulate a data base for verification of the free jet simulation technique. Detailed directivity and spectra comparisons between aerotrain data and transformed free jet data are presented for three primary jet velocities and two flight velocities for the three nozzle types. GRA

N77-33176# National Gas Turbine Establishment, Farnborough (England).

THE EFFECT OF FLIGHT ON THE NOISE OF SUBSONIC JETS

B. J. Cocking Oct. 1976 30 p refs

(AD-A041730; NGTE-R-343; DRIC-BR-556165) Avail: NTIS HC A03/MF A01 CSCL 20/4

The noise of a single-stream circular jet and a coaxial jet with coplanar nozzles of 2.5 area ratio has been measured under simulated flight conditions. The majority of tests were conducted with the single-stream jet and primary section of the coaxial jet at a nominal temperature of 880 K. The data have been used to quantify the effect of jet temperature and were combined with measurements from an earlier test series to establish a prediction method for the effect of flight on the noise of single-stream subsonic jets. This method is based on jet noise theory modified by experimentally derived constants. For coaxial jets it is concluded that the noise reductions, which are independent of the secondary stream velocity, are predicted to an acceptable degree by the method suggested for unheated single-stream jets. GRA

N77-33177# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.

SUPERSONIC JET EXHAUST NOISE INVESTIGATION. VOLUME 4: ACOUSTIC FAR-FIELD/NEAR-FIELD DATA REPORT Final Technical Report, 1 Dec. 1972 - 23 Sep. 1975

Paul R. Knott and John F. Brausch Wright-Patterson AFB, Ohio AFAPL Jul. 1976 510 p Sponsored in part by DOT

(Contract F33615-73-C-2031)

(AD-A041819; R74AEG452-Vol-4; AFAPL-TR-76-68-Vol-4) Avail: NTIS HC A22/MF A01 CSCL 20/1

This report is an acoustic data report presenting a series of parametric acoustic far-field and near-field results for subsonic and supersonic heated flow conditions for a simple conical nozzle (thin lip and thick lip) and a convergent-divergent nozzle at design and off-design conditions. Author (GRA)

N77-33178# Dayton Univ. Research Inst., Ohio.

INVESTIGATION OF LOCAL DAMAGE AND IMPULSE DELIVERED TO TURBINE BLADES BY NORMAL AND OBLIQUE PROJECTILE IMPACTS Final Report, Jan. 1975 - Jul. 1976

M. Rosenblatt, T. R. Isbelle, P. F. Fry, J. P. Barber, and H. R. Taylor Jan. 1977 102 p refs Prepared in cooperation with Calif. Res. and Technol., Inc.

(Contract F33615-75-C-5052)

(AD-A041780; AFML-TR-76-208) Avail: NTIS HC A06/MF A01 CSCL 21/5

Jet engine fan blades can be damaged by bullet impacts, or damage can occur when debris from the runway is ingested by the engine. Often, the impact can cause the fan blade to break into fragments which are also ingested by the engine. The local damage and impulse characteristics delivered to simulated blades from .50-caliber projectile impacts are examined. A combined approach involving numerical calculations and experiments is used to investigate damage and momentum transfer mechanisms for normal and oblique projectile impacts on Titanium, Aluminum, Boron-Aluminum, and Graphite-Epoxy plates. The normal impact calculations compare well with the experimental results. The major uncertainty in axisymmetric impact problems is in determining realistic dynamic material properties, especially for composite materials. The oblique impact experiments and numerical calculations demonstrate the fundamental importance of projectile yaw and rotation in determining the projectile-target damage and momentum transfer characteristics. Blade material ductility, and compressive and tensile strengths are the most important material properties involved in fan blade damage and momentum transfer from hard projectile impacts. Author (GRA)

N77-33179# Tennessee Univ. Space Inst., Tullahoma.
INVESTIGATION OF FEASIBLE NOZZLE CONFIGURATIONS FOR NOISE REDUCTION IN TURBOFAN AND TURBOJET AIRCRAFT. VOLUME 3: SHROUDED SLOT NOZZLE CONFIGURATIONS Final Report, Aug. 1975 - Mar. 1977
B. H. Goethert, J. R. Maus, William A. Dunnill, M. C. Joshi, and V. Veerasamy Mar. 1977 127 p refs
(Contract DOT-FA72WA-3053)
(AD-A041782; FAA-RD-75-162-3) Avail: NTIS HC A07/MF A01 CSCL 21/5

This report presents the results of a study of the acoustic and fluid dynamic characteristics of a shrouded slot nozzle. Experiments were carried out on a slot nozzle of aspect ratio 27 with an ejector shroud having a cross sectional area of four times the primary nozzle area. Parameters varied during the tests were, shroud length, shroud divergence ratio, and acoustical impedance of the shroud wall. Tests were conducted for primary flow Mach numbers from 0.5 to choking and stagnation temperatures from ambient to 1200 R. The results of the study show that both the thrust and the noise attenuation characteristics of the ejector shroud improve with increasing length. Thrust increases of near 40% were obtained for the longest shroud tested. A noise reduction of 13 dB was obtained for the lined shroud with a near choked, high temperature primary jet. The corresponding thrust augmentation was approximately 20%.
Author (GRA)

N77-33180# Association Aeronautique et Astronautique de France, Paris.
TURBULENT EFFECTS IN AXIAL COMPRESSORS [EFFETS INSTATIONNAIRES DANS LES COMPRESSEURS AXIAUX]
M. Sagnes 1977 63 p refs In FRENCH Presented at the 13th Colloq. d'Aerodyn. Appl., Lyon, 8-10 Nov. 1976
(Contract DRME-74/607)
(AAAF-NT-77-20; ISBN-2-7170-0437-8) Avail: NTIS HC A04/MF A01; CEDOCAR, Paris FF 25 (France and EEC) FF 29 (others)

An attempt to improve the lift and reduce the drag in turbocompressors by provoked turbulence is presented. The experimental setup is detailed and the results are discussed establishing unequivocally the possibility of inducing the required effects by sinusoidal orientation of the blades. ESA

N77-33181# Advisory Group for Aeronautical Research and Development, Paris (France).
POWER PLANT RELIABILITY
Aug. 1977 222 p refs In ENGLISH and FRENCH Presented at the 49th Meeting of the AGARD Propulsion and Energetics Panel, The Hague, 31 Mar. - 1 Apr. 1977
(AGARD-CP-215; ISBN-92-835-0198-5) Avail: NTIS HC A10/MF A01

The reliability of current civil and military engines is discussed. Plans to improve engine reliability and the role of engine diagnostics and monitoring is explored. For individual titles, see N77-33182 through N77-33199.

N77-33182# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
ENGINE STRUCTURAL INTEGRITY PROGRAM (ENSIP)
Eric E. Abell and Edward G. Koepnick *In* AGARD Power Plant Reliability Aug. 1977 4 p (For primary document see N77-33181 24-07)
Avail: NTIS HC A10/MF A01

A new military standard for turbine engines for use by the Air Force is discussed. The standard is aimed at providing overall policy and requirements for turbine engine structural development during the entire system life cycle. A first review of the tasks involved in the standard are outlined. Specific items such as duty cycle and tests concerned with fatigue considerations are noted. Author

N77-33183# Ministero della Difesa Aeronautica, Rome (Italy).
MILITARY ENGINE DETERIORATION IN SERVICE CONNECTED WITH LIFE CYCLE COSTS
G. Facca and L. Giorgieri *In* AGARD Power Plant Reliability Aug. 1977 18 p refs (For primary document see N77-33181 24-07)
Avail: NTIS HC A10/MF A01

Problems responsible for military jet engine deterioration are identified and cost structure for these problems is analyzed. Since a large amount of labor, skill and costs are involved in maintaining engines in service at an adequate standard of efficiency and safety, several standards must be met. Overall maintenance and repair life cycle costs must be comparable to the new engine cost. Design must pay proper attention to reliability and maintainability concepts from the beginning and trade-offs should be performed in order to optimize the engine overall life cycle costs. Author

N77-33184# Direction Centrale du Materiel de l'Armee de l'Air, Paris (France).
MAINTENANCE METHODS FOR IMPROVING PROPULSION SYSTEM RELIABILITY [METHODES DE MAINTENANCE POUR AMELIORER LA FIABILITE DES PROPULSEURS]
Claude Sprung *In* AGARD Power Plant Reliability Aug. 1977 9 p In FRENCH (For primary document see N77-33181 24-07)
Avail: NTIS HC A10/MF A01

Preventive measures used by the French Air Force in systematic aircraft engine maintenance procedures are described. Topics discussed include: spectrometry of oils, analysis of metal particles, engine vibration, and the use of endoscopy, ultrasonics, and gammagraphy. Transl. by A.R.H.

N77-33185# Civil Aviation Authority, Redhill (England). Airworthiness Div.
CIVIL AIRWORTHINESS REQUIREMENTS FOR POWERPLANT RELIABILITY
John Slatford *In* AGARD Power Plant Reliability Aug. 1977 6 p (For primary document see N77-33181 24-07)
Avail: NTIS HC A10/MF A01

Several aspects of aircraft reliability are discussed. These considerations relating to the safety of the aircraft and its occupants are summarized into three objectives. Any failure of an engine that could hazard the aircraft must be kept to an absolute minimum. Loss of thrust in flight must not reduce the total thrust available to the aircraft to such an extent that the flight cannot be completed safely. A normally operating engine must provide the thrust necessary for the aircraft to meet its scheduled performance and respond quickly and accurately to the demands of the pilot. Author

N77-33186# KLM Royal Dutch Airlines, Amsterdam (Netherlands).
RELIABILITY VERSUS COST IN OPERATING WIDE BODY JET ENGINES
S. K. W. J. Demarteau *In* AGARD Power Plant Reliability Aug. 1977 7 p (For primary document see N77-33181 24-07)
Avail: NTIS HC A10/MF A01

The high degree of reliability from aircraft and engines required by scheduled international airline operational and maintenance characteristics is discussed. Standards must be met in order to offer a safe but also commercially and economically justified product. A specific cost/reliability level was investigated for the General Electric CF6 engine. Reliability was found to be influenced by inherent design deficiencies, operation environment and maintenance policy. Cost consequences were dependent on airline operation, the way an airline is organized, the scale of operation and airline standards. Author

N77-33187# Service des Etudes de Propulsion, Paris (France).
RISKS AFFECTING THE STRUCTURAL RESISTANCE AND INTEGRITY OF MODERN PROPULSION SYSTEMS [LES RISQUES AFFECTANT LA RESISTANCE STRUCTURALE ET LA SECURITE DES PROPULSEURS MODERNES]
Jean A. Aguer *In* AGARD Power Plant Reliability Aug. 1977 14 p refs In FRENCH (For primary document see N77-33181 24-07)
Avail: NTIS HC A10/MF A01

The performance of modern engines already in service or those which will be in use in the 1980's and thereafter depends on higher temperature levels, greater thermal and kinetic stress and constraints, and new materials technologies for improved efficiency. To maintain the structural integrity of these engines, the effects of thermal and kinetic energies to be used in the future must be determined. Precise examples are given to

demonstrate what precautions must be taken. The most important priorities should be given to the use of titanium, engine ingestion, turbine blades, fuels and lubricants, and the thrust/weight ratio. Transl. by A.R.H.

N77-33188# Ministry of Defence, London (England). Directorate of Engine Development.

DEVELOPMENT PROCEDURES TO PROMOTE RELIABILITY

R. Holl *In* AGARD Power Plant Reliability Aug. 1977 14 p refs (For primary document see N77-33181 24-07)

Avail: NTIS HC A10/MF A01

Reliability attainment so far as the military aircraft gas turbine is concerned was studied. Civil engine development and operational reliability were considered in order to emphasize that the aircraft gas turbine, particularly in a basically non-complete form, provided a step change in reliability when compared with its predecessor, the high powered piston propeller engine. Conclusions indicate that recent concentration on the achievement of performance goals has resulted in increasingly complex and very costly engines as well as a near total lack of attention to design reliability. Author

N77-33189# Societe Nationale d'Etudes et de Construction de Moteurs d'Aviation, Moissy-Cramayel (France).

CFM56 TURBOFAN MAINTAINABILITY AND RELIABILITY-ORIENTED DEVELOPMENT

Jean-Pierre Marechal *In* AGARD Power Plant Reliability Aug. 1977 19 p In ENGLISH and FRENCH (For primary document see N77-33181 24-07)

Avail: NTIS HC A10/MF A01

Reliability and maintainability criteria introduced in the CFM 56 turbofan engine are described. A 7500 operating program will provide methodical accumulation of data so that maintenance costs may be minimized through high repairability, accessibility, modularity, and interchangeable features. Author

N77-33190# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.

AIRCRAFT ENGINE DESIGN AND DEVELOPMENT THROUGH LESSONS LEARNED

Bernard L. Koff *In* AGARD Power Plant Reliability Aug. 1977 11 p (For primary document see N77-33181 24-07)

Avail: NTIS HC A10/MF A01

Aircraft engine design was examined in terms of performance and reliability. Durability, maintenance, weight, initial cost and timing were also considered. It is stated that design and development are derivatives of a 'lessons learned' approach. Since materials, modern analytical and experimental techniques have progressed, so has our ability to design and develop modern aircraft. Author

N77-33191# Societe Nationale d'Etudes et de Construction de Moteurs d'Aviation, Moissy-Cramayel (France).

SOPHISTICATION AND RELIABILITY [SOPHISTICATION ET FIABILITE]

J. Rennesson *In* AGARD Power Plant Reliability Aug. 1977 4 p refs In FRENCH (For primary document see N77-33181 24-07)

Avail: NTIS HC A10/MF A01

When sophistication is bound to reliability, the compromise to be made rests essentially on the safety, operational, and economic aspects of engine reliability. Differences between the structural parts of an aircraft engine and its systems for regulation and control are discussed. Conceptual differences which usage can impose on single and multi-engined aircraft are examined in several examples. Costs and operational difficulties involving redundancy techniques must be considered when priorities are set. Transl. by A.R.H.

N77-33192# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.

A PROCEDURE FOR PREDICTING THE LIFE OF TURBINE ENGINE COMPONENTS

R. J. Hill *In* AGARD Power Plant Reliability Aug. 1977 9 p refs (For primary document see N77-33181 24-07)

Avail: NTIS HC A10/MF A01

A procedural method is presented for the creation of a life estimate of aircraft gas turbine engine components. The method consists of three segments -- the calculation of a modulus, the determination of a critical material property, and a comparison of the modulus to the material property with a resulting judgment. Each segment is discussed in qualitative terms and related to required validation and acceptance testing. Author

N77-33193# Direction du Materiel Etudes de Propulsion, Paris (France).

THE EVOLUTION AND CONTROL OF DIFFERENT PERFORMANCE DEGRADATION PROCESSES IN MODERN PROPULSION SYSTEMS [EVOLUTION ET CONTROLE DES DIFFERENTS PROCESSUS DE DEGRADATION DE PERFORMANCE SUR LES PROPULSEURS MODERNES]

P. Chetail *In* AGARD Power Plant Reliability Aug. 1977 17 p refs In FRENCH (For primary document see N77-33181 24-07)

Avail: NTIS HC A10/MF A01

The development of policies for jet engine maintenance and the basic principles for applying monitoring methods are discussed. Processes involved in the degradation of thermodynamic and mechanical performance are examined. A computer program is described for evaluating the efficacy of the monitoring methods from a technical and economic point of view. Transl. by A.R.H.

N77-33194# Pisa Univ. (Italy).

TESTING SIMULATION OF DAMAGES OCCURRED IN SERVICE

D. Dini and L. Giorgieri (Ministero della Difesa Aeronautica) *In* AGARD Power Plant Reliability Aug. 1977 22 p refs (For primary document see N77-33181 24-07)

Avail: NTIS HC A10/MF A01

A basic framework is presented from which further simulation of increased complexity and sophistication can be easily implemented regarding engine failures by an in-flight foreign object, large overpressure signature inlet flow distortion, and icing environment. A general basic engine reliability program is provided, capable of simulating a running turbojet-engine and its air supplying environment as an integrated system. The specific subroutines for the possible damages are to be supplied by the user. Recent advances on testing simulation of flight-incurred power plant damages promise to reduce accidents due to engine operation at low altitudes and in rugged confined terrain. State-of-the-art design techniques are discussed to improve engine reliability, including an analysis of three particular experimental simulations to determine damage causes and effects. Recommendations are put forth that will eliminate or reduce the causes of aviation accidents. Author

N77-33195# Societe Nationale d'Etudes et de Construction de Moteurs d'Aviation, Moissy-Cramayel (France).

PROGRESS IN DETERMINING SERVICE LIFE BY ENDURANCE TESTS [PROGRES DE LA DETERMINATION DE LA VIE EN SERVICE PAR LES ESSAIS D'ENDURANCE]

B. Devoge *In* AGARD Power Plant Reliability Aug. 1977 6 p In FRENCH (For primary document see N77-33181 24-07)

Avail: NTIS HC A10/MF A01

For numerous reasons, aircraft engine builders conduct long endurance tests which are notably distinguished from the usual development and certification tests. Formulas for accelerated cyclic tests were adapted for the Olympus MK 610-14-28 engine used on the Concorde. Topics discussed include a description of the cycle test compared to the flight cycle, the installation of the test equipment, and the precautions that were taken to assure a faithful representation of operational conditions. When commercial Concorde service began, the accumulated cycles represented several years of usage. Transl. by A.R.H.

N77-33196# Pratt and Whitney Aircraft, West Palm Beach, Fla. Government Products Div.

ACCELERATED MISSION TEST: A VITAL RELIABILITY TOOL

B. J. McDonnell *In* AGARD Power Plant Reliability Aug. 1977 6 p (For primary document see N77-33181 24-07)

Avail: NTIS HC A10/MF A01

The Accelerated Mission Test (AMT) has been successfully used in the F100 engine program to anticipate potential future problems. Early identification of service oriented problems has

provided the lead time necessary to take corrective action before the problems occur in operation which decreases engine 'down' time thereby improving life cycle cost. The AMT is a supplemental testing procedure and must be used in conjunction with all of the advanced structural analysis techniques. Plans are now being developed to conduct accelerated mission tests on engines that have completed the overhaul or depot cycle. The purpose of the testing will be to identify potential problem areas associated with engine parts that have been repaired in accordance with the overhaul procedures. Author

N77-33197# Technische Hochschule, Aachen (West Germany). Inst. fuer Strahlantriebe und Turboarbeitsmaschinen.

EXPERIMENTAL INVESTIGATION ON THE INFLUENCE OF COMPONENT FAULTS ON TURBOJET ENGINE PERFORMANCE

H. Toenskoetter *In* AGARD Power Plant Reliability Aug. 1977 12 p refs (For primary document see N77-33181 24-07)
Avail: NTIS HC A10/MF A01

Some results of experimental investigations on the effect of implanted local faults, e.g. turbine guide vane damage, plugged fuel nozzles, and turbine rotor blade damage, on the performance of a single spool turbojet engine are presented. The formation of flow non-uniformities downstream from the faults is especially described. In one-dimensional gas path analysis systems, circumferential-averaged thermodynamic parameters are used for fault detection. The effect of the implanted faults on some of these averaged parameters will be shown in comparison with the local parameter changes in the disturbed sector. The possibilities of using the analysis of flow non-uniformities for the isolation of local faults in the hot section of turbojet engines are discussed and questions of probe position for this diagnostic technique are ventilated. Author

N77-33198# Vereinigte Flugtechnische Werke-Fokker G.m.b.H., Bremen (West Germany).

METHODS OF IMPROVING THE PERFORMANCE RELIABILITY OF ADVANCED MILITARY POWER PLANT SYSTEMS

Richard Smyth *In* AGARD Power Plant Reliability Aug. 1977 23 p refs (For primary document see N77-33181 24-07)
Avail: NTIS HC A10/MF A01

Advanced military propulsion systems will be equipped with multi-parameter control systems based around an electronic computer making use of digital technology. Such control systems have a high degree of flexibility and can be used for a wide range of applications. This offers new possibilities of efficient and accurate monitoring of engine performance in the aircraft and by the flight support organization responsible for reliability and safety of the propulsion system. The possibilities are discussed based on the experience gained with a multi-parameter electronic engine controller of a V/STOL fighter aircraft. Special consideration is given to practical aspects such as handling procedures. Author

N77-33199# Air Force Logistics Command, Wright-Patterson AFB, Ohio.

PRELIMINARY RESULTS OF USAF EXPERIENCE WITH ENGINE MONITORING AND DIAGNOSTICS

A. Bruce Richter and Kenneth E. Eickmann *In* AGARD Power Plant Reliability Aug. 1977 6 p (For primary document see N77-33181 24-07)
Avail: NTIS HC A10/MF A01

A formal flight test evaluation of an engine health monitoring system being used on ten T-36 supersonic aircraft is described. The system consists of engine sensors, an airframe mounted Data Processing Unit (DPU), and a ground based diagnostic display unit. The sensors continuously monitor some 24 parameters including an EGT, RPM, fuel flow, and EPR; however, data is only recorded if the pilot wishes or if a gate in the DPU is triggered. Author

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N77-33200*# Virginia Polytechnic Inst. and State Univ., Blacksburg.

DIGITAL FLIGHT CONTROL SYSTEMS

Alper K. Caglayan and Hugh F. VanLandingham Sep. 1977 51 p refs
(Grant NGR-47-004-116)
(NASA-CR-145246) Avail: NTIS HC A04/MF A01 CSCL 01C

The design of stable feedback control laws for sampled-data systems with variable rate sampling was investigated. These types of sampled-data systems arise naturally in digital flight control systems which use digital actuators where it is desirable to decrease the number of control computer output commands in order to save wear and tear of the associated equipment. The design of aircraft control systems which are optimally tolerant of sensor and actuator failures was also studied. Detection of the failed sensor or actuator must be resolved and if the estimate of the state is used in the control law, then it is also desirable to have an estimator which will give the optimal state estimate even under the failed conditions. Author

N77-33201*# Rockwell International Corp., Los Angeles, Calif.

DESIGN AND DEVELOPMENT OF A STRUCTURAL MODE CONTROL SYSTEM

Oct. 1977 184 p refs
(Contract NAS4-2347)
(NASA-CR-143846; NA-77-296) Avail: NTIS HC A09/MF A01 CSCL 01C

A program was conducted to compile and document some of the existing information about the conceptual design, development, and tests of the B-1 structural mode control system (SMCS) and its impact on ride quality. This report covers the following topics: (1) Rationale of selection of SMCS to meet ride quality criteria versus basic aircraft stiffening. (2) Key considerations in designing an SMCS, including vane geometry, rate and deflection requirements, power required, compensation network design, and fail-safe requirements. (3) Summary of key results of SMCS vane wind tunnel tests. (4) SMCS performance. (5) SMCS design details, including materials, bearings, and actuators. (6) Results of qualification testing of SMCS on the 'Iron Bird' flight control simulator, and lab qualification testing of the actuators. (7) Impact of SMCS vanes on engine inlet characteristics from wind tunnel tests. Author

N77-33202*# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.

F-8C ADAPTIVE FLIGHT CONTROL LAWS Final Report

G. L. Hartmann, C. A. Harvey, G. Stein, D. N. Carlson, and R. C. Hendrick Washington NASA Sep. 1977 334 p refs
(Contract NAS1-13383)
(NASA-CR-2880; HONEYWELL-76SRC/18) Avail: NTIS HC A15/MF A01 CSCL 01C

Three candidate digital adaptive control laws were designed for NASA's F-8C digital flyby wire aircraft. Each design used the same control laws but adjusted the gains with a different adaptative algorithm. The three adaptive concepts were: high-gain limit cycle, Liapunov-stable model tracking, and maximum likelihood estimation. Sensors were restricted to conventional inertial instruments (rate gyros and accelerometers) without use of air-data measurements. Performance, growth potential, and computer requirements were used as criteria for selecting the most promising of these candidates for further refinement. The maximum likelihood concept was selected primarily because it offers the greatest potential for identifying several aircraft parameters and hence for improved control performance in future aircraft application. In terms of identification and gain adjustment accuracy, the MLE design is slightly superior to the other two, but this has no significant effects on the control performance achievable with the F-8C aircraft. The maximum likelihood design is recommended for flight test, and several refinements to that design are proposed. Author

N77-33203*# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.

F-8C ADAPTIVE FLIGHT CONTROL EXTENSIONS Final Report

Gunter Stein and Gary L. Hartmann Washington NASA Sep. 1977 143 p refs

(Contract NAS1-13383)

(NASA-CR-2881; HONEYWELL-76SRC/16) Avail: NTIS HC A07/MF A01 CSCL 01C

An adaptive concept which combines gain-scheduled control laws with explicit maximum likelihood estimation (MLE) identification to provide the scheduling values is described. The MLE algorithm was improved by incorporating attitude data, estimating gust statistics for setting filter gains, and improving parameter tracking during changing flight conditions. A lateral MLE algorithm was designed to improve true air speed and angle of attack estimates during lateral maneuvers. Relationships between the pitch axis sensors inherent in the MLE design were examined and used for sensor failure detection. Design details and simulation performance are presented for each of the three areas investigated. Author

N77-33204# Naval Postgraduate School, Monterey, Calif.

WING ROCK AS A LATERAL-DIRECTIONAL AIRCRAFT LIMIT CYCLE OSCILLATION INDUCED BY NONLINEAR AERODYNAMICS OCCURRING AT HIGH ANGLE OF ATTACK M.S. Thesis

Paul David Young Jun. 1977 69 p refs

(AD-A042104) Avail: NTIS HC A04/MF A01 CSCL 01/3

Wing rock at high angle of attack is an oscillatory lateral-directional motion phenomenon known to exist in some of today's high performance tactical aircraft. The motion has been consistently characterized as a lightly damped Dutch-Roll oscillation attributable to asymmetric wing stall. However, evidence gathered from wind tunnel simulations and at least one British study indicate that aerodynamic nonlinearities may be the source of wing rock. Regardless of the actual cause of the phenomenon, a study of wing rock has positive ramifications with respect to gaining a clearer understanding of the aerodynamics associated with high angle of attack flight. This report presents the results of an investigation of wing rock which centered on the premise that two distinct nonlinear aerodynamic mechanisms (aerodynamic hysteresis and a cubic nonlinearity in yawing moment) not only can cause wing rock but may drive it to a limit cycle oscillation as well. Author (GRA)

N77-33205# Naval Ship Research and Development Center, Bethesda, Md. Aviation and Surface Effects Dept.

STABILITY AND CONTROL OF GROUND EFFECT AIRCRAFT IN LONGITUDINAL MOTION

Rolf Staufenbiel and Bao-Tzang Yeh Jun. 1977 50 p refs Transl. into ENGLISH from Z. Flugwiss. (West Ger.), v. 24, no. 1 p 3-9; v. 24, no. 2 p 65-70

(AD-A042005; AERO-1241; DTNSRDC-77-0048) Avail: NTIS HC A03/MF A01 CSCL 01/3

Following experimental demonstration of the feasibility of ground effect aircraft (GEA's) interests has increased in their economic aspects. The stability and control characteristics of such vehicles near ground were subject to detailed investigations in order to provide design guidelines. For longitudinal motion, it could be shown that when a GEA approaches the ground, a short-period rotation (alpha-mode) and a vertical translation (B-mode) result from the known modes of the free space; these are sufficiently stable in the case of an appropriate design of such flying machines. The B-mode is particularly important for safe flight near ground. That mode is governed by a new stability measure, the so-called static altitude stability, which becomes evident by an appropriate formulation of the general static stability of the free space. The effects of design parameters, state variables, and aerodynamic derivatives on longitudinal stability near ground are discussed by means of analytical approximations and numerical calculations. Author (GRA)

N77-33206# Missouri Univ., Columbia. Dept. of Electrical Engineering.

ANALYSIS OF INHERENT ERRORS IN ASYNCHRONOUS DIGITAL FLIGHT CONTROLS Interim Report, 1 Feb. 1976 - 31 Jan. 1977

Charles Slivinsky 31 Jan. 1977 17 p refs

(Grant AF-AFOSR-2968-76)

(AD-A041813; AFOSR-77-0728TR) Avail: NTIS HC A02/MF A01 CSCL 01/4

Progress has been achieved in the study of inherent errors in asynchronous digital flight controls. The research involves model development, software development, and parametric analysis of representative flight control systems. Author (GRA)

N77-33207# Bell Helicopter Co., Fort Worth, Tex.

ROTORCRAFT FLIGHT SIMULATION WITH COUPLED ROTOR AEROELASTIC STABILITY ANALYSIS. VOLUME 1: ENGINEER'S MANUAL Final Technical Report, May 1975 - May 1976

Tyce T. McLarty May 1977 347 p refs

(Contract DAAJ02-75-C-0025; DA Proj. 1F2-62209-AH-76)

(AD-A042462; USAAMRDL-TR-76-41A; Rept-699-099-022) Avail: NTIS HC A15/MF A01 CSCL 20/4

This report consists of three volumes and documents the current version in the C81 family of rotorcraft flight simulation programs developed by Bell Helicopter Textron. This current version of the digital computer program is referred to as AGAJ76. The accompanying program for calculating fully-coupled rotor blade mode shapes is called DN9100. The first volume, the Engineer's Manual, presents an overview of the computer program capabilities plus discussions for the background and development of the principle mathematical models in the program. The models discussed include all those currently in the program. GRA

N77-33208# Advisory Group for Aeronautical Research and Development, Paris (France).

STRUCTURAL ASPECTS OF ACTIVE CONTROLS

Aug. 1977 102 p refs Partly in ENGLISH and FRENCH Proc. of 44th Meeting of AGARD Struct. and Mater. Panel, Lisbon, 21 Apr. 1977

(AGARD-CP-228; ISBN-92-835-0200-00) Avail: NTIS HC A06/MF A01

Design and implementation factors regarding flight control systems are reviewed. Flutter suppression system testing is discussed, including wind tunnel tests, as well as actual flight tests. Also considered is the impact flight command stability systems have on aircraft dynamic response. For individual titles, see N77-33209 through N77-33215.

N77-33209# British Aircraft Corp., Filton (England). Commercial Aircraft Div.

A PRACTICAL OPTIMUM SELECTION PROCEDURE FOR A MOTIVATOR IN ACTIVE FLUTTER SUPPRESSION SYSTEM DESIGN ON AN AIRCRAFT WITH UNDERWING STORES

M. R. Turner and C. G. Lodge *In* AGARD Structural Aspects of Active Controls Aug. 1977 19 p (For primary document see N77-33208 24-08)

Avail: NTIS HC A06/MF A01

Theoretical active flutter control of a variable sweep wing with external stores with four combinations of store configuration/wing sweep/Mach number was studied. Electrically modified outputs of a structure-mounted transducer were used to drive an auxiliary control surface on the wing or store. The best transducer/force positions on the wing and stores were found using Nyquist plots, representing the control surface loads by point forces. The object was to see if a common active flutter control system using a control surface on the wing could be found for a range of stores, Mach numbers and wing sweep angles. Difficulties were due to two instabilities with close frequencies in two of the configurations and very low dampings in some of the stable modes. Author

N77-33210# Vereinigte Flugtechnische Werke-Fokker G.m.b.H., Bremen (West Germany).

IMPACT OF A COMMAND AND STABILITY AUGMENTATION SYSTEM ON GUST RESPONSE OF A COMBAT AIRCRAFT

K. D. Collmann and O. Sensburg (Messerschmitt-Boelkow-Blohm GmbH, Munich) *In* AGARD Structural Aspects of Active Controls Aug. 1977 17 p refs (For primary document see N77-33208 24-08)

Avail: NTIS HC A06/MF A01

To get reasonable results for just response calculations it is necessary to introduce the elastic aircraft behaviour as well as the Command and Stability Augmentation System (CSAS) into the mathematical model. It is demonstrated how calculation results are influenced by using aerodynamic interference air forces; the influence of the CSAS is then presented. It is shown that the influence of the CSAS on the dynamic response is of prime interest and often far exceeds the influence of the elastic structure. The unsteady aerodynamic forces should be determined with three-dimensional theories including interference, and corrections to match the steady derivatives measured in the wind tunnel should be included. The impedance function, control loop transfer functions are highly nonlinear due to the nonlinearities of the hydraulic actuators. All these functions must be determined experimentally and introduced into the elastic aircraft equation. Response plots of the total system should be calculated and compared with results of so-called 'structural mode coupling tests'. If correlation is good, a major part for the investigation of structural response of the aircraft due to various input functions is verified. Author

N77-33211# British Aircraft Corp., Filton (England). Unternehmensbereich Flugzeuge.

ACTIVE FLUTTER SUPPRESSION OF AN AIRPLANE WITH WING MOUNTED EXTERNAL STORES

H. Hoenlinger *In* AGARD Structural Aspects of Active Controls Aug. 1977 15 p refs (For primary document see N77-33208 24-08)

Avail: NTIS HC A06/MF A01

A wing store flutter suppression system with store mounted vanes was designed. The system was proved effective when implemented and flight-tested on a Fiat G 91/T3 aircraft. The relatively small vanes used were very effective in controlling flutter and their use did not alter aircraft flight mechanical characteristics. J.L.H.

N77-33212# Boeing Co., Wichita, Kans.

AIRPLANE MATH MODELING METHODS FOR ACTIVE CONTROL DESIGN

Kenneth L. Roger *In* AGARD Structural aspects of active controls Aug. 1977 11 p refs (For primary document see N77-33208 24-08)

Avail: NTIS HC A06/MF A01

Selected analytical methods are described which are useful and practical in math modeling for airplane active control system design. A technique for writing state equations is presented which is suitable for incorporating lifting surface aerodynamic solutions. An economical method of computing unsteady aerodynamic influence matrices is presented for line doublets and plate doublets, the latter usable at any Mach number. An economical way to analyze three-dimensional turbulence and a convenient way of using design criteria in n-dimensions are presented to aid in designing for statistical performance. Recommendations include the use of a single airplane math model for analysis of multiple performance parameters and the use of control hardware math modeling during preliminary design. Author

N77-33213# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio. Flight Control Div.

CONSISTENCY IN AIRCRAFT STRUCTURAL AND FLIGHT CONTROL ANALYSIS

Robert C. Schwanz *In* AGARD Structural Aspects of Active Controls Aug. 1977 18 p refs (For primary document see N77-33208 24-08)

Avail: NTIS HC A06/MF A01

Military Specifications (MILSPECS) are often employed by the USAF procuring authority as guidelines for design, development, acceptance testing and mission application of military aircraft. The MILSPECS must usually be satisfied by formulations of the aerodynamic and dynamic analyses that are consistent or equivalent, if not identical. When control configured vehicle considerations are involved, however, inconsistencies resulting from analysis expediency or previous engineering convention may occur. In this paper YF-16, C-5A, B-52E and large transport aircraft design studies and flight tests provide data for a discussion and numerical illustration of these inconsistencies. It is concluded that they may be minimized or avoided altogether if flight control specialists become more familiar with restrictions of present-day unsteady aerodynamic theory, and structural specialists increase their knowledge of modern dynamics and control theory. Author

N77-33214# Boeing Aerospace Co., Seattle, Wash.

YC-14 CONTROL SYSTEM REDUNDANCY

William T. Hamilton *In* AGARD Structural Aspects of Active Controls Aug. 1977 7 p refs (For primary document see N77-33208 24-08)

Avail: NTIS HC A06/MF A01

The YC-14 is the Boeing entry in the USAF Advanced Medium STOL Transport program. The task of operating a large jet aircraft into and out of a semi-prepared, 2,000 feet long airstrip with a 27,000 pound payload presents an unusual flight control challenge. The YC-14 answers this challenge using an advanced flight control system that includes digital computers. Excellent STOL flying qualities have been achieved through control wheel steering and speed hold modes. Fail operational-fail safe performance is provided by a triplex flight control system. Aircraft dynamics following an engine failure are docile and do not require immediate pilot attention or unusual skill. The superior capability of digital computers to perform logic functions enables a comprehensive, semi-automated, preflight test. Failures are detected and identified to the Line Replaceable Unit. The YC-14's use of redundant digital computers in the flight control role is a first for an aircraft designed to demonstrate operational use. Author

N77-33215# Office National d'Etudes et de Recherches Aerospatiales, Paris (France). Div. de Recherche.

WIND TUNNEL STUDY OF AN ACTIVE FLUTTER SUPPRESSION SYSTEM

Roger Destuynder *In* AGARD Structural Aspects of Active Controls Aug. 1977 9 p refs In FRENCH; ENGLISH summary (For primary document see N77-33208 24-08)

Avail: NTIS HC A06/MF A01

Active flutter control was tested in a wind tunnel on a model of wing carrying an external tank. The aerodynamic forces of the control system were generated by a classical aileron, piloted by a miniaturized servo-control from a signal issued by an accelerometer detecting the wing movement. A single control law was used in the whole velocity range. A gain of more than 15% was obtained on the flutter critical velocity. Author

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N77-33216# Air Force Human Resources Lab., Brooks AFB, Tex. Flying Training Div.

INVESTIGATION OF DIAGNOSTIC, ERROR DETECTOR AND SELF-TAUGHT INSTRUCTIONAL STRATEGIES FOR FLIGHT SIMULATOR PROGRAMS Final Report, Apr. 1975 - May 1976

Dolores Tyler, Robert W. McFadden, Edward E. Eddowes, and Robert R. Fuller Oct. 1976 211 p refs

(AD-A035682; AFHRL-TR-76-65) Avail: NTIS HC A10/MF A01 CSCL 05/9

This study investigated the use of three instructional strategies in the training of basic instrument flight maneuvers in a T-40 simulator under standard conditions and two levels of increased task loading. The three strategies investigated were; (a) diagnostic (b) error detector and (c) self-taught. Diagnostic instructors used immediate feedback through error analysis, the error detector instructor used limited feedback, and the self-taught group was instructed without the aid of any feedback from the instructor pilot. The three levels of loading were; (a) no task loading; (b) a change in the center of gravity from normal to full forward; and (c) a change in air turbulence from zero to maximum. Twenty-seven Air Force officers awaiting entry into undergraduate

pilot training were randomly assigned to one of the three instructional strategy groups. The results indicate that there were no significant differences between the three instructional strategies i.e., the students of any one strategy performed equally as well as the students of the other two strategies. The results indicated that there were significant differences among task load conditions. A general decrement in performance was noted when the students flew the maneuvers with the center of gravity change and an even greater decrement when they flew with maximum turbulence. GRA

N77-33217# Calspan Corp., Buffalo, N. Y.
AN ASSESSMENT OF THE ROLE OF SIMULATORS IN MILITARY FLIGHT TRAINING. VOLUME 1: ASSESSMENT BASED ON SURVEY INTERVIEWS Final Report, 15 Apr. - 30 Sep. 1976
C. R. Chalk and R. Wasserman 30 Sep. 1976 157 p
(Contract MDA930-76-C-0274)
(AD-A041222; CALSPAN-AK-5970-F-1-Vol-1) Avail: NTIS HC A08/MF A01 CSCL 05/9

The objective of this study was to assess the use of simulators in military tactical flight training. The assessment was made on the basis of information obtained from a literature survey and a survey of individuals in industry and government agencies who are knowledgeable about flight simulators, military tactical flight training and related matters. Forty-six organizations were visited during the survey. Assessments are made of the use of simulators for training the following flight phases or tasks: cockpit procedures, instrument flight, emergency procedures, takeoff and landing, formation flight, aerial refueling, dynamic failures, ground attack, training of maneuver limits, recovery from uncontrolled flight, air combat and nonpilot crew stations. Other aspects of the use of simulators for aircrew training are discussed and problem areas requiring research and development effort are identified. Author (GRA)

N77-33218# Air Force Instrument Flight Center, Randolph AFB, Tex.
EVALUATION OF REVISED APPROACH LIGHTING CRITERIA Final Report
Kenneth J. Kerkering and Gerald C. Armstrong Mar. 1977 33 p refs
(AD-A038442; USAFIFC-TR-77-1) Avail: NTIS HC A03/MF A01 CSCL 01/5

The Federal Aviation Administration (FAA) has directed conversion of all ALSF-1 Category I ILS approach lighting systems with sequenced flashing lights to the Simplified Short Approach Lighting System with Runway Alignment Indicator Lights (SSALR) and Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR). The Air Force is concerned that this lighting change may have an adverse affect on the operational capability of some of its units. Therefore, Headquarters Air Force requested the USAF Instrument Flight Center (USAFIFC) conduct an in-flight pilot factors (PIFAX) evaluation of the MALSR and SSALR approach lighting systems. GRA

N77-33219# ARO, Inc., Arnold Air Force Station, Tenn.
A SURVEY OF TRANSITION RESEARCH AT AEDC Final Report, Jul. 1956 - Sep. 1976
Jack D. Whitfield and N. Sam Dougherty, Jr. AEDC Jul. 1977 63 p refs Presented at AGARD Fluid Dyn. Panel Symp. on Laminar-Turbulent Transition, Lyngby, Den., 2-4 May 1977
(ARO Proj. P32A-G2A)
(AD-A041740; ARO-PWT-TR-77-24; AEDC-TR-77-52; Paper-25) Avail: NTIS HC A04/MF A01 CSCL 20/4

This report presents a survey of experimental research on transition Reynolds numbers conducted in a large number of ground test facilities. Facilities surveyed included primary wind tunnels used for aerodynamic testing at subsonic, transonic, supersonic, and hypersonic conditions. Measurements have been made on cones and planar bodies, flat plates and hollow cylinders. This report traces the work using cones, which has been more extensive. The primary motivation for this research spanning nearly 20 years has been to verify the adequacy of the facilities to simulate flight conditions. This necessarily entailed the study of free-stream disturbances in wind tunnels and the role these disturbances play in altering transition Reynolds number which must be considered when scaling Reynolds-number-sensitive data. Results presented include current experimental efforts as recent as September 1976. In addition to the cited references, a bibliography of relevant publications from AEDC has been included. Author (GRA)

N77-33220# Advisory Group for Aerospace Research and Development, Paris (France).
A CRITICAL COMPILATION OF COMPRESSIBLE TURBULENT BOUNDARY LAYER DATA
H. H. Fernholz (Tech. Univ., Berlin) and P. J. Finley (Imp. Coll. of Sci. and Technol., London) Jun. 1977 455 p refs Document includes a non-standard size microfiche supplement of profile data. This supplement is available in microfiche on request from Computer Software Management and Information Center, Barrow Hall, Univ. of Georgia, Athens, Ga. 30601
(AGARD-AG-223; AGARDOGRAPH-223;
ISBN-92-835-1245-6) Avail: NTIS HC A20/MF A01

Data obtained in 59 experimental studies of compressible, two dimensional, turbulent boundardy layers are provided. The data are presented in standardized form as tables and microfiche, and are available on magnetic tape. The entries which describe the experiments are preceded by a general introduction describing the principles and methods applied in the compilation of the data catalogue. An initial discussion of some of the problems of interpretation encountered in this field is also provided.
Author

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N77-33221*# ECON, Inc., Princeton, N. J.
INTEGRATED STUDY PLAN FOR SPACE BIOPROCESSING (PHASE 1)
15 May 1977 11 p
(Contract NASw-3047)
(NASA-CR-155170) Avail: NTIS HC A02/MF A01 CSCL 06C

Current economic evaluation and analytical techniques are applied to decision problems faced by the space bioprocessing program. NASA decision makers are enabled to choose candidate substances, after ranking them according to their potential economic benefit. The determination of appropriate evaluation techniques necessary to obtain measures of potential economic benefits which result from the pursuit of various space bioprocessing endeavors is focused upon. The treatment of each disease is impacted by a successful outcome of space bioprocessing and specify data and other input needs for each candidate substance. Author

N77-33222*# Lockheed Missiles and Space Co., Huntsville, Ala. Research and Engineering Center.
SPACE PROCESSING APPLICATIONS OF ION BEAM TECHNOLOGY Final Report
P. G. Grodzka 15 Aug. 1977 41 p refs
(Contract NAS3-20095)
(NASA-CR-135261) Avail: NTIS HC A03/MF A01 CSCL 20L

Ion thruster engines for spacecraft propulsion can serve as ion beam sources for potential space processing applications. The advantages of space vacuum environments and the possible gravity effects on thruster ion beam materials operations such as thin film growth, ion milling, and surface texturing were investigated. The direct gravity effect on sputter deposition and vapor deposition processes are discussed as well as techniques for cold and warm welding. Author

N77-33223*# Stanford Univ., Calif. High Energy Physics Lab.
FEASIBILITY ANALYSIS OF GRAVITATIONAL EXPERIMENTS IN SPACE Final Report
C. W. F. Everitt Sep. 1977 35 p Sponsored by NASA
(Contract JPL-954524)
(NASA-CR-155148) Avail: NTIS HC A03/MF A01 CSCL 22A

Experiments on gravitation and general relativity suggested by different workers in the past ten or more years are reviewed, their feasibility examined, and the advantages of performing them in space were studied. The experiments include: (1) the gyro relativity experiment; (2) experiments to test the equivalence of gravitational and inertial mass; (3) an experiment to look for nongeodesic motion of spinning bodies in orbit around the earth; (4) experiments to look for changes of the gravitational constant G with time; (5) a variety of suggestions; laboratory tests of experimental gravity; and (6) gravitational wave experiments. Author

N77-33224*# RAND Corp., Santa Monica, Calif.
STANDARD SPACECRAFT ECONOMIC ANALYSIS. VOLUME 1: EXECUTIVE SUMMARY
E. D. Harris and J. P. Large Nov. 1976 29 p refs
(Contract NAS5-23376)
(NASA-CR-152538; R-2099/1-NASA-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 22A

A study of the comparative program costs associated with use of various standardized spacecraft for Air Force space test program missions to be flown on the space shuttle during the 1980-1990 time period is reviewed. The first phase of the study considered a variety of procurement mixes composed of existing or programmed NASA standard spacecraft designs and an Air Force standard spacecraft design. The results were briefed to a joint NASA/Air Force audience on July 11, 1976. The second phase considered additional procurement options using an upgraded version of an existing NASA design. The results of both phases are summarized. Author

N77-33225*# RAND Corp., Santa Monica, Calif.
STANDARD SPACECRAFT ECONOMIC ANALYSIS. VOLUME 2: FINDINGS AND CONCLUSIONS Final Report
E. D. Harris and J. P. Large Nov. 1976 134 p refs
(Contract NAS5-23376)
(NASA-CR-152539; R-2099/2-NASA-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 22A

The comparative program costs associated with use of various standardized spacecraft for Air Force space test program missions to be flown on the space shuttle were studied in two phases. In the first phase, a variety of procurement mixes composed of existing or programmed NASA standard spacecraft designs and an Air Force standard spacecraft design were considered. The second phase dealt with additional procurement options using an upgraded version of an existing NASA design. The results of both phases are discussed. Author

N77-33226*# Massachusetts Inst. of Tech., Cambridge. Measurement Systems Lab.
STUDIES OF ORBITAL EOETVOES EXPERIMENTS Final Report
Philip K. Chapman 30 Jun. 1977 116 p refs
(Grant NGR-22-009-735)
(NASA-CR-155193; RE-90) Avail: NTIS HC A06/MF A01 CSCL 22A

A direct force-balance technique was analyzed for carrying out the Eoetvoes experiment in space, which is intended to give sufficient sensitivity to allow investigation of the gravitational interactions of energy stored in the weak interaction. The heart of experiment is an exceedingly sensitive dual accelerometer, containing two proof masses constructed of the materials whose Eoetvoes ratio is to be compared. For use in development of the accelerometer, a magnetic microbalance is proposed in which the weight of the proof mass is supported by magnetic forces which vary very slowly with the proof mass position. It is shown that at least two different mechanizations of the magnetic suspension may be feasible. Author

N77-33820*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB: A BEGINNING
Lawrence F. Dietlein *In its* Biomed. Results from Skylab 1977 p 408-418 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 22A

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N77-33227# ARO, Inc., Arnold Air Force Station, Tenn.
GENERAL SLENDER CONE SIMULATION AT REENTRY FLOW CONDITIONS Final Report, 1 Jul. 1975 - 30 Jun. 1976
Joseph A. Johnson, III Jun. 1977 20 p refs
(Contract F40600-75-C-0001)
(AD-A041063; ARO-VKF-TR-77-38) Avail: NTIS HC A02/MF A01 CSCL 20/4

By using the results of general similarity, the problem of modeling the hypersonic flow about a reentry cone is reviewed. The techniques developed are applied to a specific proposed ballistic range experiment. Author (GRA)

N77-33228# Deutsches Geodaetisches Forschungsinstitut, Munich (West Germany).
CALCULATION OF REFERENCE ORBITS BY SOLVING SELFADJOINT BOUNDARY VALUE PROBLEM Ph.D. Thesis - Tech. Univ. Munich, Dec. 1976 [BERECHNUNG VON REFERENZBAHNEN DURCH LOESUNG SELBSTADJUNGIERTER RANDWERTAUFGABEN]
Karl Heinz Ilk Bayerische Akad. der Wiss. 1977 137 p refs (Ser-C/Diss-228; TUM-Mitt-137; ISBN-3-7696-9284-5) Avail: NTIS HC A07/MF A01

To determine reference orbits for satellite geodesy two point self-adjoint boundary value problems applied to Newton-Euler's equation of motion and Lagrange's perturbation equations were solved. The reference orbits were obtained in the form of series expansions into (orthonormal) eigenfunctions of the kernel of integral equations, equivalent to the boundary value problems. These integral equations were of Hammerstein's type. The accuracy of approximation could be increased with the aid of an analytical expression for the truncation errors of the series. The method is highly accurate, and efficient as regards computer time. Author (ESA)

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

N77-33229*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
TRACKING AND DATA SYSTEM SUPPORT FOR THE VIKING 1975 MISSION TO MARS. VOLUME 3: PLANETARY OPERATIONS
D. J. Mudgway 1 Sep. 1977 162 p refs 4 Vol.
(Contract NAS7-100)
(NASA-CR-155168; JPL-TM-33-783-Vol-3) Avail: NTIS HC A08/MF A01 CSCL 22D

The support provided by the Deep Space Network to the 1975 Viking Mission from the first landing on Mars July 1976 to the end of the Prime Mission on November 15, 1976 is described and evaluated. Tracking and data acquisition support required the continuous operation of a worldwide network of tracking stations with 64-meter and 26-meter diameter antennas, together with a global communications system for the transfer of commands, telemetry, and radio metric data between the stations and the Network Operations Control Center in Pasadena, California. Performance of the deep-space communications links between Earth and Mars, and innovative new management techniques for operations and data handling are included. Author

N77-33230*# Systems Technology, Inc., Mountain View, Calif.
RESEARCHER'S GUIDE TO THE NASA AMES FLIGHT SIMULATOR FOR ADVANCED AIRCRAFT (FSAA)
John B. Sinacori, Robert L. Stapleford, Wayne F. Jewell, and

John M. Lehman Washington NASA Aug. 1977 276 p refs
(Contract NAS2-9024)
(NASA-CR-2875; STI-TR-1074-1) Avail: NTIS HC A13/MF A01 CSCL 14B

Performance, limitations, supporting software, and current checkout and operating procedures are presented for the flight simulator, in terms useful to the researcher who intends to use it. Suggestions to help the researcher prepare the experimental plan are also given. The FSAA's central computer, cockpit, and visual and motion systems are addressed individually but their interaction is considered as well. Data required, available options, user responsibilities, and occupancy procedures are given in a form that facilitates the initial communication required with the NASA operations' group. Author

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N77-33231 Indiana Univ., Bloomington.
THE IMPLICATIONS IN SATELLITE TELEVISION FOR SOCIAL AND POLITICAL CHANGE IN THE THIRD WORLD Ph.D. Thesis
Stewart Ferguson 1977 276 p
Avail: Univ. Microfilms Order No. 77-22648.

Implications in satellite television for social and political change in the Third World were investigated. Attenuation of this change by the nature of policy and policy making processes was also discussed. Conclusions showed that out of the consideration of possible outcomes, emerged a connection between the rate at which change is induced and the destructive consequences of the change. Out of a consideration of the probable development of the satellite technology emerged the likelihood that time will intervene to temper the outcome. Dissert. Abstr.

N77-33232*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PROPELLANT MANAGEMENT REPORT FOR THE TITAN CENTAUR TC-6 EXTENDED MISSION
Raymond Lacovic 1977 43 p
(NASA-TM-73749; E-9365) Avail: NTIS HC A03/MF A01 CSCL 22B

An extended mission was conducted to perform experiments demonstrating increased operational capabilities. The Centaur propellant behavior, the effects of reduced tank pressurization levels, and a propellant duct prechill technique were successfully evaluated. The major flight data results show that: (1) the propellants can be controlled with short collection times, even with a simulated H202 engine failure; (2) extensive tank ventings can be safely performed; (3) the Centaur boost pumps can perform adequately with no LH2 tank pressurization, and with low LO2 tank pressurization levels; (4) the duct prechill technique is an effective way to reduce boost pump cavitation and improve engine chilldown; and (5) the Centaur boost pumps should be completely stopped prior to an engine start sequence. Author

N77-33233*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
VOYAGER: JOURNEY TO THE OUTER PLANETS
3 Oct. 1977 18 p
(Contract NAS7-100)
(NASA-CR-155147; JPL-SP-43-39) Avail: NTIS MF A01 SOD HC CSCL 22A

The mission plan of the Voyager Spacecraft to Jupiter, Saturn, and their satellites is briefly discussed. Emphasis is placed on the study of the origin and evolution of the solar system. J.M.S.

N77-33234*# Public Service Satellite Consortium, Denver, Colo. Engineering Dept.
EARTH STATION DESIGN AT 12/14 GHz Final Report
Jul. 1977 47 p
(Contract NAS5-23834)
(NASA-CR-152597) Avail: NTIS HC A03/MF A01 CSCL 22B

The design of a 12/14 GHz wideband two-way ground station compatible with the CTS, PSCS, and SYNCOM 4 satellites is described. Efforts to find a suitable site location in the vicinity of the Denver Network Coordinating Center are related. Author

N77-33235*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
CALIBRATION OF VIKING IMAGING SYSTEM POINTING, IMAGE EXTRACTION, AND OPTICAL NAVIGATION MEASURE
W. G. Breckenridge, J. W. Fowler, and E. M. Morgan (General Elec. Co., Fairfield, Conn.) 15 Sep. 1977 79 p
(Contract NAS7-100)
(NASA-CR-155165; JPL-Pub-77-28) Avail: NTIS HC A05/MF A01 CSCL 22B

Pointing control and knowledge accuracy of Viking Orbiter science instruments is controlled by the scan platform. Calibration of the scan platform and the imaging system was accomplished through mathematical models. The calibration procedure and results obtained for the two Viking spacecraft are described. Included are both ground and in-flight scan platform calibrations, and the additional calibrations unique to optical navigation. Author

N77-33236*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
FLOW-FIELD SURVEYS ON THE WINDWARD SIDE OF THE NASA 040A SPACE SHUTTLE ORBITER AT 31 DEG ANGLE OF ATTACK AND MACH 20 IN HELIUM
George C. Ashby, Jr. and Vernon T. Helms, III Washington Oct. 1977 62 p refs
(NASA-TM-X-3560; L-11600) Avail: NTIS HC A04/MF A01 CSCL 01A

Pitot pressure and flow angle distributions in the windward flow field of the NASA 040A space shuttle orbiter configuration and surface pressures were measured, at a Mach number of 20 and an angle of attack of 31 deg. The free stream Reynolds number, based on model length, was 5.39 x 10 to the 6th power. Results show that cores of high pitot pressure, which are related to the body-shock-wing-shock intersections, occur on the windward plane of symmetry in the vicinity of the wing-body junction and near midspan on the wing. Theoretical estimates of the flow field pitot pressures show that conical flow values for the windward plane of symmetry surface are representative of the average level over the entire lower surface. Author

N77-33237*# Computer Sciences Corp., Los Angeles, Calif.
SATELLITE TO SATELLITE TRACKING ERROR ANALYSIS STUDIES AND DATA PROCESSING
C. L. Ayres and G. Rosenblatt Oct. 1975 32 p refs
(Contract NAS5-11999)
(NASA-CR-144832; CSC/TM-75/6160) Avail: NTIS HC A03/MF A01 CSCL 22A

An error analysis was conducted to examine the effects of placing the target satellite in an orbit nearly coplanar with the relay satellite and of data span length on the accuracy with which the satellite states can be recovered. An analysis of error models using actual satellite to satellite tracking data spans is included. Results are tabulated. Author

N77-33238*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
SPACE STATION SYSTEMS ANALYSIS STUDY. PART 3: DOCUMENTATION. VOLUME 4: SUPPORTING RESEARCH AND TECHNOLOGY REPORT
Jul. 1977 81 p
(Contract NAS9-14958)
(NASA-CR-151521; MDC-G6922-Pt-3-Vol-4) Avail: NTIS HC A05/MF A01 CSCL 22A

A brief description of recommended supporting research and technology items resulting from the space station analysis study is provided. Descriptions include the title; the status with respect to the state of the art; the justification; the technical plan including objectives and technical approach; resource requirements categorized by manpower, specialized facilities, and funding in 1977 dollars; and also the target schedule. The goal is to provide high confidence in the solutions for the various functional system

development problems, and to do so within a time period compatible with the overall evolutionary space construction base schedule. Author

N77-33239*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
SPACE STATION SYSTEMS ANALYSIS STUDY. PART 3: DOCUMENTATION. VOLUME 5: COST AND SCHEDULE DATA
Jul. 1977 96 p refs
(Contract NAS9-14958)
(NASA-CR-151520; MDC-G6922-Pt-3-Vol-5) Avail: NTIS HC A05/MF A01 CSCL 22A

Cost estimates for the space station systems analysis were recorded. Space construction base costs and characteristics were cited as well as mission hardware costs and characteristics. Also delineated were cost ground rules, the program schedule, and a detail cost estimate and funding distribution. Author

N77-33240*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SATELLITE SITUATION REPORT, VOLUME 17, NUMBER 4
31 Aug. 1977 42 p
(NASA-TM-74975) Avail: NTIS HC A03/MF A01 CSCL 22A

Space objects in orbit are listed as well as those which decayed during this reporting period. Data provided include international designation and catalog number, nation of source, launch date, inclination, apogee and perigee. Transmitting frequencies for satellites being monitored by NASA space flight tracking and data network are given. Author

N77-33241# Army Electronics Command, Fort Monmouth, N. J.
SPATIAL CORRELATION OF TRANSIONOSPHERIC SIGNAL-TIME-DELAYS Final Report
H. Soicher Mar. 1977 21 p
(DA Proj. 1T1-61101-A-91)
(AD-A041447; ECOM-4483) Avail: NTIS MF A01 CSCL 20/14

Excess time delays of transionospheric radio signals introduce ranging errors in satellite-navigation and radar systems. The errors introduced by these delays can be compensated for by the prediction of the total electron content (TEC) along the signals: propagation paths. It is envisioned that such predictions should be updated at periodic time-intervals at specific locations. The question arises as to the extent of the geographic area surrounding a station with real-time TEC determination capabilities, within which TEC values could be interpolated within accepted accuracy. GRA

N77-33242# Army Missile Command, Redstone Arsenal, Ala. Advanced Systems Concepts Office.
AGGREGATED SHORADS ATTRITION WEAPON DECK
Kosta John Taras and J. C. Richardson, Jr. 2 Feb. 1977 17 p refs
(AD-A040390; DRDMI-C-77-1) Avail: NTIS HC A02/MF A01 CSCL 15/3

The aggregated short range air defense system's attrition weapon deck was developed to provide dynamic interaction between the short range air defense systems deployed in the division area and the high/medium air defense systems. The weapon deck is intended for use with the COMO III system simulation system in the high/medium air defense systems effectiveness studies. It was developed in conjunction with Project Successor and currently exists as a part of the COMO III weapon deck library. Author (GRA)

N77-33243# Boston Coll., Chestnut Hill, Mass. Space Data Analysis Lab.
DATA PROCESSING FOR THE S3 SATELLITES Technical Report, 1 Feb. 1976 - 31 Jan. 1977
Dennis E. Delorey 30 Apr. 1977 94 p
(Contract F19628-76-C-0190)
(AD-A041912; BC-SDAL-77-3) Avail: NTIS HC A05/MF A01 CSCL 09/2

Data processing systems were developed and are being implemented for the S3-1, S3-2 and S3-3 satellites. Data flow through the systems is described and the program interfaces defined. Processing requirements for the probes flown aboard the S3-2 vehicle are detailed. Data bases created at all phases of the system are defined. Spacecraft telemetry and operational modes are outlined. Author (GRA)

N77-33244# California Univ., San Diego. Inst. for Pure and Applied Physical Sciences.
SPECIFICATION OF GEOSYNCHRONOUS PLASMA ENVIRONMENT Final Report, 1 Jun. - 30 Nov. 1976
Sherman E. DeForest 1 Feb. 1977 35 p refs
(Contract F19628-76-C-0214)
(AD-A041910; AFGL-TR-77-0031) Avail: NTIS HC A03/MF A01 CSCL 04/1

Data from UCSD plasma instruments on the ATS 5 and 6 satellites has been studied to specify the geosynchronous plasma environment as it affects electrostatic charging of spacecraft. The emphasis of the initial study has been primarily to service the needs of the design engineer; while simultaneously establishing the context in which a more general model could be developed. The report includes an environmental specification plus a review of geosynchronous plasma and wave phenomena. Author (GRA)

N77-33245# European Space Agency, Paris (France).
COMPARATIVE SYSTEMS STUDY OF MAGNETICALLY SUSPENDED FLYWHEELS
Wolfgang Kleinau, Heinrich Weingarten, and Wolfgang Craemer Jul. 1977 139 p refs Transl. into ENGLISH of 'Vergleichende Systemstudie fuer Magnetisch Gelagerte Schwungraeder', MBB G.m.b.H., Munich Report BMFT-FB-W-76-20; MBB-URV-84, Dec. 1976 Original report in GERMAN previously announced as N77-23166 Original GERMAN report available from ZLDI, Munich DM 29.20
(ESA-TT-393; BMFT-FB-W-76-20; MBB-URV-84) Avail: NTIS HC A07/MF A01

A comparative study is presented of flywheels with passive or active magnetic suspension for geostationary satellites with flexible appendages. The characteristic parameters of three available types were critically compared, and the possibility of their application in spacecraft studied. The application of magnetically suspended (fixed) flywheels was investigated for geostationary satellites with large flexible solar arrays of the OTS and TVBS type, by means of simulation. ESA

N77-33246# European Space Agency, Paris (France).
MATHEMATICAL MODEL FOR ASCENT TRAJECTORY OPTIMIZATION OF A 4-STAGE LAUNCH VEHICLE FOR GEOSYNCHRONOUS MISSIONS
W. Duffek and G. C. Shau Sep. 1977 37 p refs Transl. into ENGLISH of 'Das Math. Modell zur Aufstiegsbahnoptimierung eines 4-stufigen Traegers bei Synchrongahnmissionen', DFVLR, Oberpfaffenhofen, West Ger. Report DLR-IB-552-73/4, 26 Feb. 1976 Original report in GERMAN previously announced as N77-29191
(ESA-TT-409; DLR-IB-552-73/4) Avail: NTIS HC A03/MF A01

An extensive derivation of the mathematical relations in the optimization of the ascent trajectory is presented. The three-dimensional equations of motion were derived. An approximative representation was made of the Mach number dependence of the aerodynamic coefficients, as well as of the altitude dependency of the air density. Optimality conditions for the ejection of the payload shrouds were determined. The boundary conditions of the orbital transfer problem in the case of a pulsed thrust phase of the fourth stage were examined. ESA

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N77-33247*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ORBITER/PAYLOAD PROXIMITY OPERATIONS: LATERAL APPROACH TECHNIQUE

Jerome A. Bell, Howard L. Jones, and Stewart F. McAdoo Sep. 1977 45 p
(NASA-TM-74965; JSC-13049) Avail: NTIS HC A03/MF A01 CSCL 21H

The lateral approach is presented for proximity operations associated with the retrieval of free flying payloads. An out of plane final approach emphasizing onboard software support is recommended for all except the latter segment of the final approach in which manual control is considered mandatory. An overall assessment of various candidate proximity operations techniques is made. B.B.

N77-33248*# Martin Marietta Aerospace, Denver, Colo.
SPACELAB CONTAMINATION ASSESSMENT. PAYLOAD/ORBITER CONTAMINATION CONTROL REQUIREMENT STUDY Final Report
L. E. Bareiss, M. A. Hetdrick, and E. B. Ress 30 Sep. 1977 44 p refs
(Contract NAS8-31574)
(NASA-CR-150413; MCR-77-105) Avail: NTIS HC A03/MF A01 CSCL 22A

The activities and the results obtained under the payload/orbiter contamination control requirement study were documented, and the integrated shuttle payload contamination evaluation computer model was developed. Spacelab design and development analyses based upon the predicted Spacelab induced contaminant environments were conducted utilizing the space program. Author

N77-33249*# Planning Systems and Sciences Co., Irvine, Calif.
NEW MODEL FRAMEWORK AND STRUCTURE AND THE COMMONALITY EVALUATION MODEL Final Report
26 Aug. 1977 145 p refs Prepared for JPL
(Contracts NAS7-100; JPL-954681)
(NASA-CR-155157; P21-R-001) Avail: NTIS HC A07/MF A01 CSCL 22A

The development of a framework and structure for shuttle era unmanned spacecraft projects and the development of a commonality evaluation model is documented. The methodology developed for model utilization in performing cost trades and comparative evaluations for commonality studies is discussed. The model framework consists of categories of activities associated with the spacecraft system's development process. The model structure describes the physical elements to be treated as separate identifiable entities. Cost estimating relationships for subsystem and program-level components were calculated. Author

N77-33250*# General Electric Co., Philadelphia, Pa. Valley Forge Space Center.
SHUTTLE PAYLOAD VIBROACOUSTIC TEST PLAN EVALUATION. FREE FLYER PAYLOAD APPLICATIONS AND SORTIE PAYLOAD PARAMETRIC VARIATIONS
C. V. Stahle and H. R. Gongloff 16 Sep. 1977 157 p refs
(Contract NAS5-23840)
(NASA-CR-152594; Doc-77SDS4250) Avail: NTIS HC A08/MF A01 CSCL 22A

A preliminary assessment of vibroacoustic test plan optimization for free flyer STS payloads is presented and the effects on alternate test plans for Spacelab sortie payloads number of missions are also examined. The component vibration failure probability and the number of components in the housekeeping subassemblies are provided. Decision models are used to evaluate the cost effectiveness of seven alternate test plans using protoflight hardware. Author

N77-33251*# General Electric Co., Philadelphia, Pa. Valley Forge Space Center.
FEASIBILITY AND SYSTEMS DEFINITION STUDY FOR MICROWAVE MULTI-APPLICATION PAYLOAD (MMAP) Final Report, Sep. 1976 - Sep. 1977
J. B. Horton, C. C. Allen, M. J. Massaro, J. L. Zemany, J. W. Murrell, R. W. Stanhouse, G. P. Condon, R. F. Stone, J. Swana, and M. Afifi Sep. 1977 183 p refs
(Contract NAS5-23734)
(NASA-CR-152611; Doc-77SDS4220) Avail: NTIS HC A09/MF A01 CSCL 22A

Work completed on three Shuttle/Spacelab experiments is examined: the Adaptive Multibeam Phased Array Antenna (AMPA) Experiment, Electromagnetic Environment Experiment (EEE) and Millimeter Wave Communications Experiment (MWCE). Results included the definition of operating modes, sequence of operation, radii of operation about several ground stations, signal format, foot prints of typical orbits and preliminary definition of ground and user terminals. Conceptual hardware designs, Spacelab interfaces, data handling methods, experiment testing and verification studies were included. The MWCE-MOD I was defined conceptually for a steerable high gain antenna. Author

N77-33252*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPACE SHUTTLE PROGRAM: LIGHTNING PROTECTION CRITERIA DOCUMENT
4 Nov. 1975 79 p refs Revised
(NASA-TM-74974; JSC-07636-Rev-A) Avail: NTIS HC A05/MF A01 CSCL 22B

The lightning environment for space shuttle design is defined and requirements that the design must satisfy to insure protection of the vehicle system from direct and indirect effects of lightning are imposed. Specifications, criteria, and guidelines included provide a practical and logical approach to protection problems. Author

N77-33253*# Chrysler Corp., Michoud, La. Space Div.
RESULTS OF A LANDING GEAR LOADS TEST USING A 0.0405-SCALE MODEL (16-0) OF THE SPACE SHUTTLE ORBITER IN THE ROCKWELL INTERNATIONAL NAAL WIND TUNNEL (OA163B), VOLUME 1
R. C. Mennell (Rockwell Intern. Corp., Los Angeles) Jul. 1977 756 p refs 2 Vol.
(Contract NAS9-13247)
(NASA-CR-151370; DMS-DR-2361-Vol-1) Avail: NTIS HC A99/MF A01 CSCL 22B

Aerodynamic loads on a sting mounted 0.045-scale representation of the 140C outer mold line space shuttle orbiter configuration were measured to verify orbiter landing gear system pressure loading and hinge moment levels. Pressure, force, and hinge moment data, recorded over smaller increments of the landing gear deployment schedule to insure data accuracy and to investigate the effects of asymmetric gear deployment on all parameters, are presented. Tests were conducted at a Mach number of 0.17, and freestream dynamic pressure of 42.5 psf, and a Reynolds number per unit length of 1.2 million foot. Angle of attack variation was -2 to 10 degrees while angles of sideslip varied from -5 to 5 degrees. Author

N77-33254*# Chrysler Corp., Michoud, La. Space Div.
RESULTS OF A LANDING GEAR LOADS TEST USING A 0.0405-SCALE MODEL (16-0) OF THE SPACE SHUTTLE ORBITER IN THE ROCKWELL INTERNATIONAL NAAL WIND TUNNEL (OA163B), VOLUME 2
R. C. Mennell (Rockwell Intern. Corp., Los Angeles) Jul. 1977 755 p refs 2 Vol.
(Contract NAS9-13247)
(NASA-CR-151371; DMS-DR-2361-Vol-2) Avail: NTIS HC A99/MF A01 CSCL 22B

For abstract, see N77-33253.

N77-33255*# Martin Marietta Corp., Denver, Colo.
TECHNOLOGY REQUIREMENTS FOR ADVANCED EARTH-ORBITAL TRANSPORTATION SYSTEMS: SUMMARY REPORT Final Report
Rudolph C. Haefeli, Ernest G. Littler, John B. Hurley, and Martin G. Winter Washington NASA Oct. 1977 62 p
(Contract NAS1-13916)
(NASA-CR-2867) Avail: NTIS HC A04/MF A01 CSCL 22B

Areas of advanced technology that are either critical or offer significant benefits to the development of future Earth-orbit transportation systems were identified. Technology assessment was based on the application of these technologies to fully reusable, single-state-to-orbit (SSTO) vehicle concepts with horizontal landing capability. Study guidelines included mission requirements similar to space shuttle, an operational capability beginning in 1995, and main propulsion to be advanced hydrogen-fueled rocket engines. The technical and economic

feasibility of this class of SSTO concepts were evaluated as well as the comparative features of three operational take-off modes, which were vertical boost, horizontal sled launch, and horizontal take-off with subsequent inflight fueling. Projections of both normal and accelerated technology growth were made. Figures of merit were derived to provide relative rankings of technology areas. The influence of selected accelerated areas on vehicle design and program costs was analyzed by developing near-optimum point designs. Author

N77-33256*# Martin Marietta Corp., Denver, Colo.
TECHNOLOGY REQUIREMENTS FOR ADVANCED EARTH-ORBITAL TRANSPORTATION SYSTEMS, DUAL-MODE PROPULSION Final Report
Rudolph C. Haefeli, Ernest G. Littler, John B. Hurley, and Martin G. Winter Washington NASA Oct. 1977 88 p refs
(Contract NAS1-13916)
(NASA-CR-2868) Avail: NTIS HC A05/MF A01 CSCL 22B

The application of dual-mode propulsion concepts to fully reusable single-stage-to-orbit (SSTO) vehicles is discussed. Dual-mode propulsion uses main rocket engines that consume hydrocarbon fuels as well as liquid hydrogen fuel. Liquid oxygen is used as the oxidizer. These engine concepts were integrated into transportation vehicle designs capable of vertical takeoff, delivering a payload to earth orbit, and return to earth with a horizontal landing. Benefits of these vehicles were assessed and compared with vehicles using single-mode propulsion (liquid hydrogen and oxygen engines). Technology requirements for such advanced transportation systems were indentified. Figures of merit, including life-cycle cost savings and research costs, were derived for dual-mode technology programs, and were used for assessments of potential benefits of proposed technology activities. Dual-mode propulsion concepts display potential for significant cost and performance benefits when applied to SSTO vehicles. Author

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

N77-33257*# General Dynamics/Electronics, San Diego, Calif. Electronics Div.
STDN RANGING EQUIPMENT Final Report
C. E. Jones Dec. 1975 214 p
(Contract NAS5-20456)
(NASA-CR-152603; R-75-074) Avail: NTIS HC A10/MF A01 CSCL 22D

Final results of the Spaceflight Tracking and Data Network (STDN) Ranging Equipment program are summarized. Basic design concepts and final design approaches are described. Theoretical analyses which define requirements and support the design approaches are presented. Design verification criteria are delineated and verification test results are specified. Author

N77-33258*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EARLY PERFORMANCE OF THE 12-GHz, 200-WATT TRANSMITTER EXPERIMENT PACKAGE IN THE COMMUNICATIONS TECHNOLOGY SATELLITE
Washington Oct. 1977 66 p refs
(NASA-TM-X-3555; E-9104) Avail: NTIS HC A04/MF A01 CSCL 17B

Measured performance characteristics of the transmitter experiment package (TEP) aboard the Communications Technology Satellite for the first 90 operating days in orbit are presented. The TEP consists of a nominal 200-watt output stage tube (OST), a supporting power processing system (PPS), and a variable-conductance heat pipe system (VCHPS). The OST, a traveling-wave tube augmented with a 10-stage depressed collector, has an overall saturated average efficiency of 51.5 percent and an average saturated radiofrequency (RF) output power at center-band frequency of 240 watts. The PPS operated with a measured efficiency of 86.5 percent to 88.5 percent. The VCHPS, using three pipes to conduct heat from the PPS and the body of the OST to a 52-centimeter by 124-centimeter (20.5-in. by 48.75-in.) radiator fin, maintained by the PPS baseplate temperature below 50 C for all operating conditions. The TEP performance characteristics presented include frequency response, RF output power, efficiency, and distortions. Communications characteristics were evaluated by using both video and audio modulated signals. Author

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N77-33259*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ENTRY DYNAMICS OF SPACE SHUTTLE ORBITER WITH LONGITUDINAL STABILITY AND CONTROL UNCERTAINTIES AT SUPERSONIC AND HYPERSONIC SPEEDS
Howard W. Stone and Richard W. Powell Oct. 1977 67 p refs
(NASA-TP-1084; L-11288) Avail: NTIS HC A04/MF A01 CSCL 22B

A six-degree-of-freedom simulation analysis was conducted to examine the effects of longitudinal static aerodynamic stability and control uncertainties on the performance of the space shuttle orbiter automatic (no manual inputs) entry guidance and control systems. To establish the acceptable boundaries, the static aerodynamic characteristics were varied either by applying a multiplier to the aerodynamic parameter or by adding an increment. With either of two previously identified control system modifications included, the acceptable longitudinal aerodynamic boundaries were determined. Author

N77-33260*# Harris Corp., Melbourne, Fla.
AAFE LARGE DEPLOYABLE ANTENNA DEVELOPMENT PROGRAM: EXECUTIVE SUMMARY Final Report
NASA Washington Oct. 1977 45 p
(Contract NAS1-13943)
(NASA-CR-2894) Avail: NTIS HC A03/MF A01 CSCL 09C

The large deployable antenna development program sponsored by the Advanced Applications Flight Experiments of the Langley Research Center is summarized. Projected user requirements for large diameter deployable reflector antennas were reviewed. Trade-off studies for the selection of a design concept for 10-meter diameter reflectors were made. A hoop/column concept was selected as the baseline concept. Parametric data are presented for 15-meter, 30-meter, and 100-meter diameters. A 1.82-meter diameter engineering model which demonstrated the feasiblity of the concept is described. Author

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

N77-33261*# Wolf Research and Development Corp., Riverdale, Md.
CALIBRATION RESULTS FOR THE GEOS-3 ALTIMETER
C. F. Martin and M. L. Butler Sep. 1977 125 p refs
(Contract NAS6-2639)
(NASA-CR-141430) Avail: NTIS HC A06/MF A01 CSCL 14B

Data from the GEOS-3 altimeter were analyzed, for both the intensive and global modes, to determine the altitude bias levels for each mode and to verify the accuracy of the time tags which have been applied to the data. The best estimates of the biases are -5.30 + or - .2 m (intensive mode) and -3.55 m + or - .4 m (global mode). These values include the approximately 1.6 m offset of the altimeter antenna focal point from the GEOS-3 spacecraft center-of-mass. The negative signs indicate that the measured altitudes are too short. The data is corrected by subtracting the above bias numbers for the respective modes. Timing corrections which should be applied to the altimeter data were calculated theoretically, and subsequently confirmed through crossover analysis for passes 6-8 revolutions apart. The time tag correction that should be applied consists of -20.8 msec + 1 interpulse period (10.240512 msec). Author

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N77-33262*# California Univ., La Jolla. Dept. of Physics.
ACTIVE EXPERIMENTS IN MODIFYING SPACECRAFT POTENTIAL: RESULTS FROM ATS-5 AND ATS-6 Final Report, Apr. 1976 - 1977
R. Olsen and E. C. Whipple Jul. 1977 151 p refs
(Contract NAS5-23481)
(NASA-CR-152607; UCSD-SP-77-01) Avail: NTIS HC A08/MF A01 CSCL 21C

Instruments on ATS-5 and ATS-6 were operated to study the phenomena of spacecraft charging. The ion engine neutralizers were operated in attempts to modify the spacecraft potentials. The neutralizer on ATS-5 is a hot filament emitting electrons, while the neutralizer on ATS-6 is a low energy plasma bridge. The diagnostics used were particle detectors, counting electrons and protons as a function of energy. Operations were conducted in daylight and eclipse. This report describes the processing data from these and other operations. Only preliminary analysis of some of this data has been carried out, with the following results: (1) electron emission does not perturb the status of a low potential satellite by more than 50 volts, (2) emission of a low energy plasma does not change low potentials by more than a few volts, (3) when ATS-6 enters eclipse in the presence of a high energy plasma, the neutralizer suppresses any rise (within a few volts resolution), (4) when the electron emitter on ATS-5 is operated, it serves to discharge negative potentials from thousands to hundreds of volts. Author

N77-33263# AiResearch Mfg. Co., Los Angeles, Calif.
ROCKET RADIATION HANDBOOK. VOLUME 1: ROCKET RADIATION PHENOMENOLOGY AND THEORY
Jozef W. Eerkens Jun. 1974 567 p refs
(Contract F33657-72-C-0850)
(AD-A042640; AiResearch-74-9903-Vol-1) Avail: NTIS HC A24/MF A01 CSCL 21/8

A review is given of various mechanisms responsible for the generation of infrared, visible, and ultraviolet radiation from aerospace rockets. Key mechanisms responsible for most of the observed radiation are identified by examining the order-of-magnitude of the energy that is fed to each one. For the exhaust, the major mechanisms are: Undisturbed Core Relaxation (CORE); Afterburning (AB); Air Shock Collisional Deceleration (CD); Atmospheric pumping (ATMP); Solar Scattering by Particles (SOSP); Solar Ultraviolet Absorption and Reradiation (SUAR), while radiation from vehicle hardware is primarily caused by: Vehicle Body Solar Reflections (VBSR); Vehicle Body Earthshine Reflections (VBER); Vehicle Body Self-Emissions (VBSE). The AB and CD mechanisms are coupled and abbreviated ABCD. CORE and ABCD radiation are produced in different regions of the rocket plume and it is shown that they can be analyzed separately; together they are responsible for most of the infrared emissions from a thrusting rocket. ATMP is a weak infrared afterglow radiation from the slowed-down exhaust cloud that is active only at medium-high altitudes. It decays slowly but is usually not observed because of its dilution and because it is outside the field-of-view of a vehicle-tracking sensor. SOSP and SUAR are primarily operative in the visible part of the spectrum. SUAR is important at altitudes above 135 km and is shown to be the origin of several spectacular emissions in the visible observed during the Apollo space flights. Examples are presented on how to calculate altitude dependent rocket-radiation signatures in the infrared. GRA

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N77-33264*# California Univ., Berkeley.
SULFUR POISONING OF HYDROCARBON OXIDATION BY PALLADIUM M.S. Thesis
Arthur James Baumgartner [1975] 169 p refs
(Grant NGR-05-003-478)
(NASA-CR-155192) Avail: NTIS HC A08/MF A01 CSCL 07C

Using a differential bed recycle reactor the oxidation of ethane and diethyl ketone by a Pd catalyst was studied at the 0-30 ppm level in air. In both cases first order kinetics were observed. The sthane oxidation rate was characterized n the Arrhenius form by a pre-exponential of 1.0 x 10 to the 8th power cm/sec and an E sub a of 27 kcal/mole. The diethyl ketone oxidation rate was characterized by a pre-exponential of 5.7 x -1000 cm/sec and E sub a of 14 kcal/mole. Poisoning of ethan oxidation was also investigated by hydrogen sulfide and to a smaller extent by the refrigerants Freon 22 and Gentron 142-B. Poisoning by Gentron 142-B was much more severe than by hydrogen sulfide. Kinetic experiments indicated that only the pre-exponential was changing. Author

24 COMPOSITE MATERIALS

Includes laminates.

N77-33265*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RECENT ADVANCES IN LIGHTWEIGHT, FILAMENT-WOUND COMPOSITE PRESSURE VESSEL TECHNOLOGY
R. F. Lark 22 Sep. 1977 34 p refs Presented at the 1977 Energy Conf., Houston, Tex., 18-23 Sep. 1977; sponsored by ASME
(NASA-TM-73699; E-9239) Avail: NTIS HC A03/MF A01 CSCL 11D

A review of recent advances is presented for lightweight, high performance composite pressure vessel technology that covers the areas of design concepts, fabrication procedures, applications, and performance of vessels subjected to single cycle burst and cyclic fatigue loading. Filament wound fiber/epoxy composite vessels were made from S glass, graphite, and Kevlar 49 fibers and were equipped with both structural and nonstructural liners. Pressure vessels structural efficiencies were attained which represented weight savings, using different liners, of 40 to 60 percent over all titanium pressure vessels. Significant findings in each area are summarized. Author

N77-33266*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
THEORY OF ULTRASONIC DIFFRACTION BY DAMAGE DEVELOPED IN THIN LAMINATED COMPOSITES Semiannual Status Report, 1 Apr. - 30 Sep. 1977
D. T. Hayford and E. G. Henneke Oct. 1977 111 p refs
(Grant NsG-1254)
(NASA-CR-155161) Avail: NTIS HC A06/MF A01 CSCL 11D

The apparent attenuation which would result if certain damage states (transverse cracks and delaminations) are introduced into a graphite/epoxy laminate through which an ultrasonic wave passes is investigated. Experimental data for two different laminates are presented which shows changes in the apparent attenuation of about one db. These changes generally occur at loads which correspond to the range predicted for the formation of the damage. The predicted changes in the attenuation for several simple and common damage states are well within the range of experimental values. Author

N77-33267# General Dynamics/Fort Worth, Tex.
RESPONSE OF GRAPHITE COMPOSITES TO LASER RADIATION Final Scientific Report, 1 Feb. 1976 - 30 Apr. 1977
K. G. Kibler, H. G. Carter, and J. R. Eisenmann Mar. 1977 115 p refs
(Contract F44620-76-C-0030; AF Proj. 2307)
(AD-A041283; FZM-6661; AFOSR-77-0706TR) Avail: NTIS HC A06/MF A01 CSCL 11/4

Experimental and analytical investigations of the response of graphite-epoxy composite tensile coupons to laser radiation have been performed. Three different 5208/T300 laminates were used to compare stacking sequence effects, three thicknesses of one of the laminates were studied, and an aluminum alloy was employed for comparison purposes. The experimental program has concentrated on laser-induced controlled-depth damage, physical characterization of the damaged area, and residual tensile strength measurements. Thermal response measurements were conducted on selected specimens to aid in assessing the damage mechanisms and to formulate a penetration model. An additional feature of the experiments included laser exposure of preloaded specimens to determine the requisite energy-to-fracture. By considering the material response in three different incident intensity ranges, there was delineated the interactions which occur and formulated models which predict the thermal response, mass ablation, and penetration in those ranges. The strength retention for partially-penetrated, laser-damaged composites is describable in terms of fracture-mechanics-based predictions at all but the lowest intensity investigated, where essentially only resin sublimation occurs. Painted aluminum is more susceptible than composites to damage at high intensity, while strength retentions are similar at intermediate intensities. Author (GRA)

N77-33268# IIT Research Inst., Chicago, Ill.
BIAXIAL TESTING OF GRAPHITE/EPOXY COMPOSITES CONTAINING STRESS CONCENTRATIONS, PART 1 Final Report, 1 Apr. 1975 - 30 Sep. 1976
I. M. Daniel Dec. 1976 153 p refs
(Contract F33615-75-C-5113; AF Proj. 7340)
(AD-A041490; AFML-TR-76-244-Pt-1) Avail: NTIS HC A08/MF A01 CSCL 11/4

An experimental program was conducted to study the behavior under uniaxial and biaxial tensile loading of quasi-isotropic graphite/epoxy plates with circular holes and through-the-thickness cracks and to determine the influence of notch size on failure. Experimental stress analysis techniques used were strain gages, photoelastic coatings and moire grids. Recorded failure strains at the notch have exceeded twice the ultimate strain of the unnotched laminate. In specimens with circular holes failure initiates at characteristic points of high strain concentration with nonlinear response located at 22.5-deg. from some or all fiber directions. Failure at the crack tip in the form of a damage zone propagates usually along one of the fiber directions. Failure occurs when this damage zone reaches some critical value. There also seems to exist a threshold notch size below which the laminate becomes notch-insensitive. At least under uniaxial loading, it was found that the notch strength for the laminate studied is independent of notch geometry. Notch size effect can be satisfactorily explained and predicted using as a failure criterion the stresses averaged over a distance of 3-5 mm from the notch boundary. The strength reduction of plates with holes under equal biaxial loading is approximately 30 percent lower than under uniaxial loading and the two cases represent upper and lower bounds. GRA

N77-33269# Prototype Development Associates, Inc., Santa Ana, Calif.
A GENERAL THREE-DIMENSIONAL COMPUTATIONAL MODEL FOR NONLINEAR COMPOSITE STRUCTURES AND MATERIALS Final Report, Oct. 1975 - Oct. 1976
Edward L. Stanton Jun. 1977 80 p refs
(Contract N00014-76-C-0161)
(AD-A041413; PDA-TR-1045-00) Avail: NTIS HC A05/MF A01 CSCL 11/4

A computational model for the analysis of structural and microstructural behavior in general solids of composite material is presented. Emphasis is placed on representing the anomalous material behavior of composites and on the construction of computational models with variable properties. Alternative material models using continuum and statistical mechanics were reviewed and a modular code designed for compatibility with several different models. The constituent materials are characterized in terms of those state variables that correlate a materials response such as effective stress or strain energy. A parametric cubic representation is used for all state variables, the solid geometry and all physical properties. The associated finite element extends isoparametric modeling to allow properties, linear or nonlinear, to vary over the volume of an element as in rosette material construction. Applications of the model to a carbon-carbon unit cell, to strain singularities and to the inelastic response of a graphite bar illustrate its utility. Good agreement with triaxial test data for inelastic strains under hydrostatic pressure is obtained. Numerical results are computed using PATCHES-III and the conjugate gradient algorithm without the assembly of large matrices. This approach is tailored for vector processors and can reduce the high cost of nonlinear three-dimensional analyses. Author (GRA)

N77-33270# Pennsylvania Univ., Philadelphia. Moore School of Electrical Engineering.
DEVELOPMENT OF INTERCALATED GRAPHITE MATERIALS Annual Technical Report, 30 Jun. 1975 - 31 Jul. 1976
Lawrence R. Hanlon Aug. 1976 86 p refs
(Contract F33615-75-C-5231)
(AD-A041214; AFML-TR-76-196) Avail: NTIS HC A05/MF A01 CSCL 11/4

Graphite intercalation compounds were prepared from highly-oriented pyrolytic graphite and SbF5 or SbF5-HF mixtures using a variety of techniques. These compounds were characterized by X-ray and gravimetric analysis, c-axis thickness increase, and in some cases by elemental analysis. Room temperature measurements of the basal-plane electrical conductivity and the .07-2.0 eV (17.7-67 microns) optical reflectance were made. High stage SbF5 compounds were found to exhibit a reflectance of over 90% at wavelengths greater than 8 microns. These compounds also were relatively stable in air; lifetimes over 760 hours were observed several times. The highest electrical conductivity, 8 times greater than pure graphite, was observed for Stage 1 compounds; these are unstable in air. No significant differences were observed in the properties of SbF5 and SbF5-HF compounds. Author (GRA)

N77-33271# Lockheed-California Co., Burbank.
LOCKALLOY Be-38Al MATERIAL CHARACTERIZATION, 1976 YEAR-END REPORT
J. F. Sullivan and A. C. Haramis 10 May 1977 108 p
(AD-A041284; LR-28051) Avail: NTIS HC A06/MF A01 CSCL 11/4

Lockalloy, Be-38Al, is a beryllium-aluminum composite material originally developed by LMSC. The potential use of Lockalloy as a structural material is emphasized for applications on Hypersonic Flight Vehicles or other installations requiring high stiffness to weight ratios, high heat conductivity and/or high specific heat. This year-end report documents the results to date of a testing program to further establish the characteristics of Lockalloy material. The testing was performed by Advanced Design Projects (ADP) personnel. These tests involved experimental and analytical studies conducted to obtain additional information regarding basic Be-38Al Lockalloy material properties and characteristics. The studies provide data regarding impact strength, resistance to stress corrosion, response to post-manufacturing thermal treatment, weldability, and inspectability. The accuracy of methods for determining the modulus of elasticity and predicting compression instability (column strength) were also verified. In addition, the behavior of this material in certain

structural concepts, considered for the X-24C airplane was evaluated. GRA

N77-33272# RAND Corp., Santa Monica, Calif.
ADVANCED COMPOSITES: ELECTROMAGNETIC PROPERTIES, VULNERABILITIES, AND PROTECTIVE MEASURES Interim Report
A. L. Hiebert May 1977 55 p refs Sponsored by AF (AD-A042043; R-1979-AF) Avail: NTIS HC A04/MF A01 CSCL 11/4

This report outlines and discusses a measurement and analysis program for assessing the electromagnetic (EM) properties and vulnerabilities of, and protective measures for, advanced composite materials used in the design and construction of aerospace vehicles. The main objective is to suggest areas for investigation and the kind of information needed for the compilation of a data base. Six areas of investigation are discussed: advanced composite materials, structural composition, and fabrication; potential use of composite materials and structures; fundamental EM parameters of advanced composites; energy sources and environments of EM hazards; EM vulnerabilities and shielding effectiveness criteria; protective measures. Examples of measurement techniques and/or essential data are given for each. A suggested format for cataloging the information is included. Author (GRA)

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

N77-33273 Engineering Sciences Data Unit, London (England).
HEAT CAPACITY AND ENTHALPY OF LIQUIDS. 3: HALOGENATED ETHANES AND ETHYLENES
Mar. 1977 17 p
(ESDU-77007; ISBN-0-85679-177-6) For information on availability of series, sub-series, and other individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161. HC $242.50

Values of saturated liquid heat capacity and enthalpy for the halogenated ethanes and ethylenes is presented. For most compounds the range covered is from the melting point to the normal boiling point or to the limit of the experimental data whichever is the higher. Quantities are expressed in SI units and conversion factors to other units are provided. ESDU

N77-33274 Columbia Univ., New York.
STUDIES OF THE MECHANISM OF AgCl/Ag ELECTRODE REACTION Ph.D. Thesis
Lidia Slusarek 1977 111 p
Avail: Univ. Microfilms Order No. 77-14847

The electrochemical behavior of suspensions of AgCl in a supporting electrolyte was examined, utilizing oscillographic polarography and cyclic voltammetry. Macroscopic observations of particle movement show a mixing of the suspension around the drop in the potential region of reduction. Cyclic voltammograms of the suspensions show two sharp reduction and oxidation peaks. Linear dependence of the peak cathodic current on the square root of the voltage scan speeds and concentrations of chloride ions were found. It is shown that the entire reduction process is controlled by homogeneous Cl(-)ion diffusion. Mathematical analysis of the over-all reaction was undertaken with the Nernst equation applied to the reacting species. Results of the mathematical analysis show that the Nernst equation is obeyed for the present system. Dissert. Abstr.

N77-33275 New Orleans Univ., La.
A STUDY OF THE HEMIN HETEROGENEOUS RATE CONSTANT IN NON-AQUEOUS SOLVENTS WITH ON-LINE COULOSTATIC SYSTEM Ph.D. Thesis
Richard Merle Rice 1976 114 p
Avail: Univ. Microfilms Order No. 77-12723

An on-line computer system was developed for the coulostatic electrochemical technique. A numerical method which corrects for relaxation of the double layer capacitance after charge injection was designed, implemented, and confirmed experimentally by a concentration study of hexacyanoferrate solutions. This correction allows meaningful coulostatic measurements of the heterogeneous rate constants (ks) of dilute solutions. The ks of hemin complexed with imidazole in dimethyl sulfoxide (DMSO) and mixtures of DMSO with ethanol were studied. It was shown that the hemin ks was larger in the solvent mixtures than in pure DMSO. Dissert. Abstr.

N77-33276 Pittsburgh Univ., Pa.
THE COULOMETRIC DISSOLUTION AND ELECTROCHEMICAL BEHAVIOR OF TITANIUM ANODES IN METHANOL Ph.D. Thesis
Dale Everett Lueck 1976 207 p
Avail: Univ. Microfilms Order No. 77-15157

The variables related to the coulometric dissolution of titanium in methanol solutions of sulfuric acid, perchlorate, and chloride electrolytes were studied. The effects of electrolyte type and concentration, current density, electrode surface preparation, air or nitrogen saturation and ultrasonic agitation of the electrolysis cell were characterized by their effects on the current efficiency and the apparent valence of the titanium ions produced. The dissolutions were carried out using constant current coulometric techniques and the resulting solutions were analyzed for titanium content. Dissert. Abstr.

N77-33277 Adelphi Univ., Garden City, N. Y.
STATISTICS OF CHAIN MOLECULES BETWEEN TWO ADSORBING SURFACES Ph.D. Thesis
Milan Paunovic 1977 279 p
Avail: Univ. Microfilms Order No. 77-14274

The exact enumeration method was used to study the effect the excluded volume constraint has on configurational properties of chain molecules between two adsorbing surfaces. The chain molecules were computer generated on a four-choice simple cubic lattice system. Two models were studied: a simple cubic lattice with the constraint that all chains are initiated on the surface, and a simple cubic lattice with the constraint that all chains are initiated on the middle layer in the space between the two adsorbing surfaces. Dependence of configurational properties on chain length and the interaction energy has been determined for the following configurational properties: the average number and fraction of adsorbed atoms, the mean-square end-to-end distance, the average distance of the end of the chain molecule from the surface, the average maximum distance of the chain molecule from the surface and the average fraction of atoms at each layer. Dissert. Abstr.

N77-33278 Oregon State Univ., Corvallis.
GAS PHASE X-RAY PHOTOELECTRON SPECTROSCOPY OF COMPOUNDS CONTAINING MULTIPLY-BONDED OXYGEN Ph.D. Thesis
Steven Reid Smith 1977 87 p
Avail: Univ. Microfilms Order No. 77-14074

An X-ray capable of operating at up to 80 watts produces over four times the photoelectro intensity of its predecessor. Carbon 1s and oxygen 1s ionization energies were measured for 11 esters, 4 acids, acetone, and carbon monoxide. A procedure for computing the uncertainty of individual ionization energy measurements was formulated and employed. Core ionization energies were found with proton affinities for compounds containing doubly-bonded oxygen. Thus, the doubly-bonded oxygen provides the site of protonation for acids and esters in the gas phase. The slope of the core ionization energy-proton affinity was found to be about -1.6. Core ionization energies are correlated to gas phase acidities (anionic proton affinities) for the fluorine-substituted acetic acids with a slope of -1.1. An empirical method of separately evaluating inductive and relaxation shifts was then developed. Finally, a four-parameter equation that was developed to analyze gas-phase ionization processes was extended to apply to most of the compounds included in this study. Dissert. Abstr.

N77-33279 Clark Univ., Worcester, Mass.
AN ELECTRON PARAMAGNETIC RESONANCE STUDY OF SOME TETRADENTATE SCHIFF BASE COMPLEXES OF COPPER (II) Ph.D. Thesis

Michele Ilene Scullane 1976 99 p
Avail: Univ. Microfilms Order No. 77-14772

The room temperature electron paramagnetic resonance spectra of single crystals of four tetradentate Schiff base metal complexes were studied. In each case 1-2% of the copper(II) chelate was doped into the corresponding nickel(II) chelate to produce magnetically dilute samples. Values of the molecular orbital coefficients calculated for the complexes indicate the presence of considerable covalency in the metalligand sigma bonds, and of significant in-plane pi bonding. The electron paramagnetic resonance spectrum of a magnetically concentrated single crystal of the linear chain compound N,N'-bis-(trifluoracetylacetone)ethylenediimine copper(II) was investigated. The angular dependence of the linewidth anisotropy was measured, as well as the lineshape at 0 deg and 55 deg from the chain axis, and the data were interpreted in terms of a one-dimensional spin-diffusive model. On the basis of the results, this compound appears to exhibit one-dimensional magnetic behavior. Dissert. Abstr.

N77-33280 Brown Univ., Providence, R. I.
THE INTEGRATED INFRARED INTENSITIES OF THE FUNDAMENTAL VIBRATIONS OF ACETYLENE, ACETYLENE d2 AND EFFECTIVE CHARGES Ph.D. Thesis
George Bryan Mast 1976 130 p
Avail: Univ. Microfilms Order No. 77-14165

The infrared intensities of the fundamental vibrations of acetylene and acetylene-d2 were measured by the Wilson-Wells-Penner-Weber method. The measurements were determined at a total pressure of approximately 6.895 MPa of helium in order to insure adequate pressure broadening of the rotational fine structure. The intensities determined in this manner were: C2H2(nu3), Gamma = 2.110 + or - 0.047 sq cm/mM; C2H2(nu5), Gamma = 32.040 + or - 1.396 sq cm/mM; C2D2(nu3), Gamma = 1.697 + or - 0.034 sq cm/M; C2D2(nu5), Gamma = 20.808 + or - 1.008 sq cm/mM. The derivative of dipole moment with respect to r(CH) was to be 0.1885 + or - 0.0045e; that with respect to theta (HHC) is equal to 0.2330 + or - 0.0079 e. The problems inherent in the interpretation of intensities when the interpretation is in terms of dipole-moment derivatives, polar tensors or electro-optical parameters are not present in the effective charge formulation. For acetylene, the experimental value of the hydrogen effective charge is: + or - 0.404 e which is approximately equal to the theoretically derived value of: + 0.362 e. Dissert. Abstr.

N77-33281 Rhode Island Univ., Kingston.
TEMPERATURE PROGRAMMED EXCHANGE STUDIES OF SUPPORTED METAL CATALYSTS Ph.D. Thesis
Prithviraj Mukherji 1976 125 p
Avail: Univ. Microfilms Order No. 77-8296

The effect of preparative methods on the temperature programmed exchange of deuterium gas with surface hydrogen was studied on several platinum/alumina and platinum/silica catalysts. The results of the temperature programmed exchange were supported by infrared spectroscopic and neutron activation studies. In general, the presence of the metal on the support lowered the exchange temperatures by some 50 C, but for the platinum/silica catalysts made from chloroplatinic acid, the exchange temperatures were shifted upwards. It was found that catalysts prepared from the dinitrodiamine Pt(II) complex had lower OH concentrations per square centimeter than those impregnated with chloroplatinic acid. This was due to adsorption of hydrochloric acid on the active sites of the catalysts made from chloroplatinic acid. The nature of these active sites is discussed with reference to their activity in a number of other reactions. Dissert. Abstr.

N77-33282 Arizona Univ., Tucson.
MASS FILTERING AND VELOCITY ANALYSIS OF PRODUCTS OF SINGLE COLLISION REACTIONS OF BARIUM WITH ALKALI HALIDES Ph.D. Thesis
Harold Gary Pippin 1977 205 p
Avail: Univ. Microfilms Order No. 77-15354

The differential cross section as a function of angle and velocity has been measured for crossed molecular beam reactions of barium with potassium chloride potassium iodide, cesium chloride, and casium iodide. For the angular dependence study the reaction products were separated by a quadrupole mass filter. In each reaction the specie detected was the alkali metal product. The reactions proceed via intermediate complexes which are in the 'osculating' complex category. In all reactions the average product translational energy was a small fraction of the available energy. Calculations of rotationally inelastic scattering differential cross sections were performed on the system Ba+ KCl. The calculations show the dependence of the angular distribution on various choices of the phase of the S-matrix elements. Dissert. Abstr.

N77-33283 Pittsburgh Univ., Pa.
GAS PHASE REACTIONS OF OH RADICALS STUDIED BY MOLECULAR RESONANCE FLUORESCENCE Ph.D. Thesis
James John Margitan 1976 133 p
Avail: Univ. Microfilms Order No. 77-15158

The termolecular recombinations of OH with NO and NO2 were studied for M = He, Ar and N2 at pressures from 1-10 torr and temperatures from 230-450 K. The reactions were found to be in their low pressure, third order limit. The rate constants at 295 K are given for both series of reactions. The Arrhenius activation energies are -1.7kcal for NO and -1.8kcal for NO2. Rate constants were also calculated for the reactor between OH and HNO3 to produce H2O and NO3, and the reaction of OH and CH4 giving CH3 and H2O. The exchange reaction of OH with deuterium atoms, was studied at room temperature using resonance fluorescence detection of both OH and OD in separate experiments. The forward rate constant was measured. Dissert. Abstr.

N77-33284 Wisconsin Univ., Madison.
THE UNDERSTANDING OF MOLECULAR PROPERTIES BY BOTH EXPERIMENTAL AND THEORETICAL METHODS: THE LOCALIZED MOLECULAR ORBITALS OF TRANSITION METAL COMPLEXES, AND THE IONIZATION POTENTIALS OF n-ALKENES Ph.D. Thesis
David Alan Krause 1976 390 p
Avail: Univ. Microfilms Order No. 77-8796

To study the bonding properties of CO as a terminal ligand, the localized molecular orbitals of free CO, cis-Cr(CO)2, Fe(CO), Ni(CO), CR(CO)6, Fe(CO)5, Ni(CO)4, Mn2(CO)10, and Co2(CO)8 were obtained by the Boys dipole moment integral and INDO energy localization methods. The Boys method was found to describe the uniqueness of the localized bonding structure more thoroughly than the INDO method. Both methods were then used to compute localized orbitals for several metal - metal bonded molecules, both with and without bridging groups. The compounds studied were Mn2(CO)10, Co2(CO)8, Fe2(CO)9, and Fe2(CO)6S2. Localized orbitals are less useful in this case because the bond order in the bridging carbonyls is between two and three, but here also, the Boys method was found more useful than the INDO one. The electronic structure of olefins was then investigated. It was found that of the methods investigated, the Fenske-Hall one gave the best correlation with the photoelectron spectral data and is the most useful for the interpretation and understanding of these results. In addition, the effects of chemical structure on these n-alkene ionization potentials were studied. Dissert. Abstr.

N77-33285 Illinois Univ., Urbana-Champaign.
NUCLEAR MAGNETIC RESONANCE INVESTIGATION OF THE STRUCTURE AND DYNAMICS OF VALINE TRANSFER RIBONUCLEIC ACID (ESCHERICHIA COLI) Ph.D. Thesis
Rodney Verner Kastrup 1977 127 p
Avail: Univ. Microfilms Order No. 77-14968

Resonances from methyl and methylene protons on modified bases of tRN sub 1(val) are shown to be clearly resolvable in NMR spectra. Evidence is presented that, at least for the high tRNA concentration used in the NMR, low salt concentrations produce multiple, partially denatured conformations, rather than a unique form, for tRNA sub 1 (val). It was shown that native structure can be almost completely reformed by addition of NaCl, although Mg2t is required to promote native structure formation in the region of 7-methylguanosine. Spin-lattice relaxation measurements and spin-spin measurements were used to obtain information about motion of the proton groups showing resolved

resonances in the NMR spectrum. Paramagnetic relaxation enhancement by Mn ions was used to estimate distances from metal ion binding sites to proton groups which have resolved resonances in the NMR spectrum. Dissert. Abstr.

N77-33286 Fordham Univ., New York.
STRUCTURE ANALYSES OF SEVERAL ORGANIC COMPOUNDS USING X-RAY CRYSTALLOGRAPHIC TECHNIQUES Ph.D. Thesis
Robert Peter Gruska 1977 134 p
Avail: Univ. Microfilms Order No. 77-14894

2-Chloro-4'-diethylamino-4-methyl sulfonyl-6'-propion-amido azobenzene and 6-acetamido-6bromo-2-cyano-4'-diethylamino-4-nitro azobenzene were two of four azo disperse dyes whose crystalline structures were determined using X-ray crystallographic techniques. Both dyes crystallized in the centrosymmetric monoclinic space group P2 sub 1/c with four molecules per unit cell. The unit cell parameters were measured. Both structures were determined by the heavy atom-method. Structural features of 2,4,8,10-Tetra-tert-butyl tricyclo (4.4.0.0) deca-3,6,8,10- and patterson method. The dewar crystalized in the centrosymmetric triclinic space group P1 with two molecules per unit cell. tric triclinic space group P1 with two molecules per unit cell. The unit cell parameters were measured. The dewar bridge was measured at (1.589(3)A). The postulated structure of the tricyclic, 8-amino-5,y-dimethoxy-9-keto-6-methylpyrrolo(1,2-a) was proven using the direct phasing method. Dissert. Abstr.

N77-33287 South Carolina Univ., Columbia.
RAMAN SPECTRA OF MOLECULES WITH ANHARMONIC VIBRATIONS IN THE GASEOUS AND SOLID PHASES Ph.D. Thesis
Michael Garen Griffin, Sr. 1976 138 p
Avail: Univ. Microfilms Order No. 77-13885

The Raman spectra of gaseous hydrazine and hydrazine-d sub 4 was recorded from 40 to 3500 per cm. The Raman spectra of (14NO)2 and (15NO)2 were studied at 20 K. The far infrared of (14NO)2 at 20 K was also measured. The Raman spectra of both solid hydrazine and hydrazine-d sub 4 were recorded and the splitting in the intramolecular fundamental region indicates that there are at least four molecules per primitive cell. The microwave spectra of six isotopic species of methylchloroformate CC02CH3, were recorded from 18.0 to 40.0 GHz. The Raman and far infrared spectra of the vapor are reported. The Raman spectra of gaseous propane-d sub 0 and -d sub 3 were recorded between 0 and 3500 per cm. The Raman spectra of gaseous dimethylamine-d sub 0 -d sub 3 and -d sub 6 were recorded between 50 and 4000 per cm. The far infrared spectra were recorded between 300 and 100 per cm. Dissert. Abstr.

N77-33288 Pittsburgh Univ., Pa.
HYDROGEN SOLUBILITY IN RARE EARTH INTERMETALLIC COMPOUNDS Ph.D. Thesis
Andrew James Goudy 1976 120 p
Avail: Univ. Microfilms Order No. 77-15232

RFe3 and R2Co7 (R is a rare earth metal) compounds were found to be very receptive to hydrogen. The proton densities in most cases were as high as that in liquid hydrogen. Accordingly, measurements were made pertaining to the thermodynamics of hydride formation, specifically pressure-composition isotherms from which delta H, delta G and delta S for the hydrogenations could be determined. The data provide information as to the hydride stabilities. Affinity of an alloy for hydrogen: (1) decreases as the atomic number of the rare earth element increases; (2) is greater for the RFe3 compounds; and (3) increases with increased rare earth content of the compound. Crystallographic data for a goodly portion of the RFe3-H were obtained to measure any structural changes which occur upon hydriding. Second order kinetics were observed for the hydrogen desorption. Dissert. Abstr.

N77-33289 Brown Univ., Providence, R. I.
A THEORETICAL APPROACH TO GLASS TRANSITION PHENOMENA Ph.D. Thesis
Jeffrey M. Gordon 1976 126 p
Avail: Univ. Microfilms Order No. 77-14120

Three areas of glass transition phenomena were investigated: the existence of a glass transition for simple liquids and systems of hard spheres; a non-equilibrium model for the kinetic features of glass formation; and the composition dependence, for binary mixtures, of the glass transition temperature and of supercooled liquid transport properties. In each case the analysis proceeds from the viewpoint of the configurational entropy theory for glassification. Results provide evidence to further support the validity and wide range of applicability of this theory. Dissert. Abstr.

N77-33290 Columbia Univ., New York.
SCATTERING OF ROTATIONAL STATE SELECTED C sF MOLECULES BY LOW ENERGY ELECTRONS, 1. DETERMINATION OF THE SURFACE DISULFIDE BRIDGE IN PROTEINS BY PULSE RADIOLYSIS, 2 Ph.D. Thesis
Robert Carol Fukuda 1977 191 p
Avail: Univ. Microfilms Order No. 77-14800

I. A pre- and a post-collision electrostatic quadrupole permits the measurement of total cross sections for specific J to J' processes for CsF molecules. Experimental evidence favors the no mixing case as actually occurring but the mixing case can not be precluded. II. Carbon dioxide (-) ions are known to react selectively with disulfide bridges to form a disulfide radical which has a detectable transient absorption peak at 410 nm. Experimental results indicate that ribonuclease and oxidized azurin have no exposed disulfide bridges; reduced azurin, insulin, and pepsin have a partially exposed disulfide bridge; carboxypeptidase A, alpha-chymotrypsin, lysozyme, lipoic acid trypsin and papain have a single disulfide bridge; transferrin soybean trypsin inhibitor, and bovine serum albumin have 3 to 4 surface disulfide bridges. Dissert. Abstr.

N77-33291 Columbia Univ., New York.
STUDY OF SELECTED DIATOMIC METAL OXIDES AND HALIDES USING CHEMILUMINESCENCE AND LASER-INDUCED FLOURESCENCE Ph.D. Thesis
Charles Robert Dickson 1977 191 p
Avail: Univ. Microfilms Order No. 77-15278

Studies were made of the visible chemiluminescance resulting from the reaction of an atomic beam of samarium or europium with O3, N2O, NO2, and F2 under single collision conditions. The spectra obtained for SmO, EuO, SmF, and EuF are considerably more extensive than previously observed. Spectra of the diatomic molecule SmO were obtained from the reaction of Sm with O3, N2O, NO2, O2, CO2, and SO2. A study is made of the visible chemiluminescence resulting from the reaction of an atomic beam of barium with 12 under single collision conditions. The chemiluminescent intensity of the Pb + F2 reaction is studied under beam-gas conditions at F2 pressures of .0001 torr and in the presence of argon at approximately 7 torr. Dissert. Abstr.

N77-33292 Ohio State Univ., Columbus.
STUDIES OF CRYSTAL FIELD, TEMPERATURE, AND CONCENTRATION EFFECTS ON THE LOWEST TRIPLET STATES OF AROMATIC MOLECULES IN MIXED SINGLE CRYSTALS Ph.D. Thesis
Alvin Stanley Cullick 1976 309 p
Avail: Univ. Microfilms Order No. 77-10309

Electron paramagentic resonance absorptions by the lowest triplet states of chrysene and 1,2;5,6-dibenzanthracene in p-terphenyl single crystals and of phenanthrene and naphthalene in biphenyl single crystals were investigated at fields typically below 30 G. The origin of multiple resonance absorptions from triplet guests substituted into p-terphenyl is discussed with respect to the structure of p-terphenyl and was found to arise as a result of a p-terphenyl phase transition near 180 K by observing magnetic resonance absorptions from 1,2-benzanthracence in p-terphenyl. Linewidths of resonance absorption signals were found to depend on guest concentration and this dependence was attributed to spin-spin interactions. The liquid-solid phase behavior of the phenanthrene-biphenyl system is reported. Dissert. Abstr.

N77-33293 Brown Univ., Providence, R. I.
DIELECTRIC CONSTANTS, PAIR INTERACTIONS AND MOLECULAR SHAPE OF POLAR MOLECULES Ph.D. Thesis
Thomas Glenn Copeland 1976 94 p
Avail: Univ. Microfilms Order No. 77-14104

Pair interactions in pure CF3H and CH3F and in CF3H-argon and CH3F-argon mixtures were investigated using viscosity measurements, second pressure virial coefficients and second dielectric virial coefficients. Using Lennard-Jones parameters values of the quadrupole moments were derived from B sub p data. A simple steric model based on van der Waals radii and molecular models is shown to give qualitative agreement with the derived shape factors for both the pure gases and for the mixed pair. Dissert. Abstr.

N77-33294 Illinois Univ., Urbana-Champaign.
HIGH PRESSURE NMR SELF-DIFFUSION STUDIES OF HYDROGEN BONDED AND RELATED LIQUID SYSTEMS Ph.D. Thesis
Jane Austin Akai 1977 146 p
Avail: Univ. Microfilms Order No. 77-14922

Self-diffusion measurements by the NMR spin-echo technique were made for several dense liquids with temperature and pressure as experimental variables. When necessary, densities and shear viscosities were also measured under the same experimental conditions. Two main subjects are treated. The first subject, whose motivation was to investigate hydrogen bonding effects on self-diffusion at various temperatures and pressures, deals with self-diffusion in the hydrogen bonded liquids, methyl alcohol-OD and several diamagnetic electrolyte solutions in D2O. The second subject deals with three molecular liquids (neopentane, t-butyl chloride, and t-butyl alcohol-OD) that have molecules of nearly identical shape and size. Self-diffusion in these liquids was measured in order to study the effects of introducing a dipole moment and a group capable of hydrogen bond interaction. Dissert. Abstr.

N77-33295 Temple Univ., Philadelphia, Pa.
PYRAZINECARBOXYLATE, ISOMERIC PYRIDINIUMCARBOXYLATES AND ISOMERIC NITROBENZOATES AS BRIDGING LIGANDS IN ELECTRON TRANSFER REACTIONS Ph.D. Thesis
Herbert Hillel Stark 1977 63 p
Avail: Univ. Microfilms Order No. 77-13589

The rapid reduction of pyrazinecarboxylatopentaamminecobalt(3) ion by chromium(2) and europium(2) was studied by stopped flow techniques. An intermediate is observed in the chromium(2) case. The stoichiometry of the reduction of pyrazinecarboxylatopentaamminechromium(3) ion by chromium-(2) and europium(2) was investigated. These processes are complete at some stage of reaction before any reduction of the chromium(3) center occurs. 2-pyridinecarboxylic acid was found to catalyze the europium(2) reduction of pyridinium carboxylatopentaammine-cobalt(3) complexes. Reduction of nitrobenzoatopentaamminecobalt(3) complexes by the weak reducing agent hexaammineruthenium(2) yields one model of cobalt(2) for each mole of reductant consumed. On the contrary, reductions of nitrobenzoatopentaammine complexes of cobalt(3) or ruthenium(3) by various reducing agents are chracterized by reduction of ligand at the expense of reduction of the metal center. Dissert. Abstr.

N77-33296*# General Electric Co., Philadelphia, Pa. Space Sciences Lab.
LABORATORY STUDIES OF SILICON VAPOR DEPOSITION, PHASE A Final Report
R. T. Frost, G. W. Racette, and E. H. Stockhoff 22 Aug. 1977 63 p refs
(Contract NAS1-14650)
(NASA-CR-145236) Avail: NTIS HC A04/MF A01 CSCL 07D

A system is described capable of carrying out silicon vapor deposition experiments in the low 10 to the minus 10th power torr vacuum range. The system was assembled and tested for use in a program aimed at exploration of vacuum heteroepitaxy of silicon on several substrates of potential interest for photovoltaic applications. An experiment is described in which a silicon layer 2.5 microns thick was deposited on a pyrolytically cleaned tungsten substrate held at a temperature of 400 C. Using a resistance heated silicon source, thicker layers can be deposited in periods of hours by utilizing closer source to substrate distances. Author

N77-33297*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LEAN PREMIXED/PREVAPORIZED COMBUSTION
A. H. Lefebvre, ed. (Purdue Univ., Lafayette, Ind.) 21 Jan. 1977 46 p Presented at Workshop, Cleveland, Ohio, 20-21 Jan. 1977
(NASA-CP-2016; E-9255) Avail: NTIS HC A03/MF A01 CSCL 21B

Recommendations were formulated on the status and application of lean premixed/prevaporized combustion to the aircraft gas turbine for the reduction of pollutant emissions. The approach taken by the NASA Stratospheric Cruise Emission Reduction Program (SCERP) in pursuing the lean premixed/prevaporized combustion technique was also discussed. The proceedings contain an overview of the SCERP program, the discussions and recommendations of the participants, and an overall summary. Author

N77-33298# Tennessee Univ., Knoxville. Dept. of Chemistry.
LOW TEMPERATURE FLUORINE CHEMISTRY OF ELECTRONEGATIVE ELEMENTS Final Report, 1 Jan. 1973 - 31 Dec. 1976
Gleb Mamantov and Norman R. Smyrl 15 Apr. 1977 59 p refs
(Grant DA-ARO(D)-31-124-73-G96)
(AD-A041439; ARO-10932.2-C) Avail: NTIS HC A04/MF A01 CSCL 07/4

Several new interhalogen species have been prepared and characterized by matrix isolation methods. Bromine difluoride, dibromine fluoride, and dibromine difluoride have tentatively been identified by infrared matrix isolation spectroscopy. These species were formed in a number of different experiments utilizing both UV-photolysis and microwave discharge excitation. The chlorine and bromine hexafluoride radicals have been prepared by gamma-radiolysis of approximately five mole percent of the precursor molecule (chlorine or bromine pentafluoride) suspended in a sulfur hexafluoride matrix and subsequently characterized by electron spin resonance. The previously reported chlorine tetrafluoride radical has also been formed by the same technique utilizing chlorine trifluoride or pentafluoride/sulfur hexafluoride mixtures. Author (GRA)

N77-33299# Purdue Univ., Lafayette, Ind. Project SQUID Headquarters.
A SHOCK TUBE STUDY OF THE H2/02/CO/AR AND H2/N2O/CO/Ar SYSTEMS
Anthony M. Dean (Missouri Univ., Columbia), Don C. Steiner (Missouri Univ., Columbia), and Edward E. Wang (Missouri Univ., Columbia) May 1977 40 p refs
(Contract N00014-75-C-1143; Proj. SQUID)
(AD-A041340; SQUID-UMO-2-PU) Avail: NTIS HC A03/MF A01 CSCL 07/4

Emissions at 450 nm and 4.27 micrometers have been measured when a variety of mixtures containing H2, CO, either O2 or N2O, and Ar were heated behind reflected shock waves to temperatures of 2000-2850 K and total concentrations near 5 x 10 to the 18th power molecule/cc. These emissions were used to obtain absolute concentration - time data for both oxygen atoms and carbon dioxide. The data were then compared to the results of numerical integrations of the likely mechanisms. It was observed that quantitative agreement between calculations and observations were obtained for the H2/CO/O2/Ar system using recent high temperature literature rate constants. For the H2/CO/N2O/Ar system, the rate constant for the reaction: H + N2O yields N2 + OH was adjusted so as to fit the data. Here it was found that a good fit to both (O) and (CO2) profiles could be achieved with k = 3 x 10 to the -9th power exp(-113kJ/RT) cc/molecule. Comparison to data at lower temperatures suggests that this might be another example of a 'Non-Arrhenius' rate constant. The implications of these results to studies of hydrocarbon oxidation are discussed. Author (GRA)

N77-33300# New Mexico State Univ., Las Cruces. Dept. of Physics.
RELATIONS AMONG KUBELKA-MUNK COEFFICIENTS AND ABSORPTION AND SCATTERING COEFFICIENTS OF POWDERS Final Technical Report. 1 Jan. 1976 - 28 Feb. 1977
G. H. Goedecke and M. Rahman 20 Apr. 1977 78 p refs

(Grant DAAG29-76-G-0077)
(AD-A041110; NMSU-PHYS-76-00003; ARO-13542.1-GSX) Avail: NTIS HC A05/MF A01 CSCL 07/4

The use of the Kubelka-Munk (KM) theory to predict absorption and scattering coefficents of powders from values of diffuse reflectance of an incident radiation beam is shown to lead to errors of 20% or less, for realistic model powders. The use of a conventional plausible relation to predict imaginary refractive index from absorption coefficient is found to produce errors of the order of 200%. Methods for correcting these errors are discussed. A new radiative transfer equation is derived and analyzed for applications to close-packed strongly absorbing or strongly reflecting media. For such media, the new equation predicts reflectances and transmittances which are significantly different from those predicted by the standard transfer equations. Author (GRA)

N77-33301# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.

DENSITY, COMPRESSIBILITY, THERMAL CONDUCTIVITY, AND MECHANICAL MOVEMENT OF SOLID HYDRAZINE Interim Report

E. T. Chang, T. M. Poston, and N. A. Gokcen 1 Oct. 1976 36 p refs
(Contract F04701-76-C-0077)
(AD-A042039; TR-0077(2409-01)-1; SAMSO-TR-77-31) Avail: NTIS HC A03/MF A01 CSCL 07/4

Thermophysical properties and mechanical movement of solid hydrazine in tubes were determined under various conditions. The density, rho sub s, of solid hydrazine was measured at various temperatures, and the results were fitted into rho sub s(g/ml) = 1.1869 0.000675 t, where t is temperature in C. The melting point of hydrazine increases with pressure by 0.00945 C/atm, but if the pressurization is accomplished with gaseous nitrogen, a slightly smaller increase occurs. Thus, at 40.83 atm of nitrogen, the increase in the melting temperature is 0.38 C. The compressibility coefficient, Beta sub s, of solid hydrazine was measured at various temperatures and pressures to obtain Beta sub s = .0001 cu ft atm, which is independent of temperature from -30 to -4C and pressure from 0 to 30 lb/sq in. The thermal conductivity of solid hydrazine was also measured; the result is .000252 Btu(sec ft F). The foregoing values (except the elevation of freezing point) were compared with the corresponding values for liquid hydrazine. The rates of movement of solid hydrazine in straight and 120 degree -bent tubes at various temperatures by pressure exerted from one end were measured. The water added in hydrazine permits easier movement of solid because of the presence of eutectic liquid particles distributed in the solid. Extensive results on the gliding behavior are summarized. Recommendations are made to alleviate stresses caused by freezing and melting of hydrazine in confining tubes and valves. Author (GRA)

N77-33302# United Technologies Research Center, East Hartford, Conn.

DEVELOPMENT OF A THREE-DIMENSIONAL COMBUSTOR FLOW ANALYSIS. VOLUME 2: THEORETICAL STUDIES Final Report, 1 Jun. 1975 - 1 Oct. 1976

Howard J. Gibeling and Henry McDonald Wright-Patterson AFB, Ohio AFAPL 1 Oct. 1976 61 p refs
(Contract F33615-74-C-2028)
(AD-A042122; AFAPL-TR-75-59-Vol-2) Avail: NTIS HC A04/MF A01 CSCL 21/2

A three-dimensional computational procedure is presented for calculating the coupled flow and chemistry within rectangular or axisymmetric combustors with a discrete circumferential distribution of injection ports. The compressible time-averaged Navier-Stokes equations are solved with coupled pseudo-kinetic hydrocarbon chemistry including the effects of turbulence, droplet vaporization and burning, and radiation transport. A two-equation turbulence transport model utilizing the turbulence kinetic energy and its dissipation rate is employed via the Prandtl-Kolmogorov hypothesis to determine the turbulent viscosity. The governing equations are solved using the Multidimensional Implicit Nonlinear Time-dependent (MINT) procedure, which employs a unique linearization technique and a Douglas-Gunn alternating-direction-implicit (ADI) scheme. Calculations were made for the flow in a rectangular combustion chamber with a discrete distribution of inlet injection ports and the results are compared with the experimental data available for this configuration. Author (GRA)

N77-33303# Wisconsin Univ., Madison. Materials Science Center.

ISLAND DISSOLUTION PHASE TRANSITION IN A CHEMISORBED LAYER

T-M. Lu, G-C. Wang, and M. G. Lagally 27 Jul. 1977 15 p refs
(Contract N00014-76-C-0727)
(AD-A042444) Avail: NTIS HC A02/MF A01 CSCL 07/4

A phase transition has been observed in O chemisorbed on W(110) at low coverages, with a transition temperature about 250 K lower than that observed for saturation coverage W(110)p(2 x 1) - O. This transition is interpreted in terms of two-dimensional dissolution of islands. A fit to lattice gas models for both low and saturation coverage allows separate determination of the attractive and repulsive adatom-adatom interactions, and gives values of -0.069eV/atom and 0.15eV/atom respectively. Author (GRA)

N77-33304# Army Armament Research and Development Command, Dover, N. J. Large Caliber Weapons Systems Lab.

PHOTOCHEMICAL STUDIES OF SECONDARY NITRAMINES. PART 2: ULTRAVIOLET PHOTOLYSIS AND OZONOLYSIS OF RDX IN AQUEOUS SOLUTIONS Technical Report, Apr. 1975 - Dec. 1976

Andrew F. Smetana and Suryanarayana Bulusu Jun. 1977 30 p refs
(AD-A042715; ARLCD-TR-77039-Pt-2) Avail: NTIS HC A03/MF A01 CSCL 19/1

The purpose of this study was to determine the feasibility of chemical degradation of RDX by an ultraviolet-ozone process which had been previously developed for eliminating TNT from pink water. A study of UV photolysis at 254, 300 and 350 nm wavelengths, ozonolysis alone and a combination of O3 and UV (350 nm) on aqueous solutions of RDX was undertaken. The results indicate that O3 + UV in combination efficiently degrade RDX to gaseous products. These products are further compared with those obtained by photolysis and thermal decomposition of samples of crystalline RDX. Author (GRA)

N77-33305# California Univ., Berkeley. Lawrence Berkeley Lab.

SIMULTANEOUS REACTIONS ON A ROTATING-DISK ELECTRODE

R. E. White Mar. 1977 137 p refs
(Contract W-7405-eng-48)
(LBL-6094) Avail: NTIS HC A07/MF A01

The governing equations, which do not include the effect of ionic migration but do include the radial dependence of the concentrations and potential, are used to generate a parameter which characterizes the effect of a side reaction on the limiting-current curve of a main reaction. Various predicted current-potential curves illustrate the importance of this parameter for copper deposition with simultaneous formation of dissolved hydrogen at a disk electrode rotating in a copper sulfate solution containing sulfuric acid. Deposition of copper from an aqueous solution containing cupric and ferric chloride is modeled. The potential distribution and concentration profiles within the diffusion layer are predicted for given potential differences between the electrode and the solution. A cuprous ion, which is formed by the reduction of the complexed cupric ion at the electrode, is stabilized in the chloride solution and can react either at the electrode or with ferric species within the diffusion layer. The assumptions that this homogeneous reaction is fast and irreversible generates a reaction plane, whose position is shown in the concentration and potential profiles. ERA

N77-33306# Oak Ridge Y-12 Plant, Tenn.

PROPERTIES OF THERMALLY CONTRACTING TANTALUM TUNGSTATE

C. E. Holcombe, Jr., D. D. Smith, J. D. Lore, and H. L. Richards 22 Feb. 1977 35 p refs
(Contract W-7405-eng-26)
(Y-2071) Avail: NTIS HC A03/MF A01

An investigation of the properties of three high-purity (greater than 99 wt percent) tantalum tungstates included a determination

of the following properties: densities (both bulk and theoretical), refined lattice constants, maximum-use (temperatures, microhardness, heat capacities, thermal expansions (contraction) and diffusivities, calculated thermal conductivities, and electrical resistivities. A proposed mechanism showed that thermal contraction can result from an effective tilt (expansion) of the distorted oxygen coordination polyhedra into channels within the structures. Hysteresis in the thermal contraction curves can be accounted for, primarily, by a plastic deformation component (resulting from thermal stresses at the polycrystalline grain-boundary contact points) added to the elastic lattice strains.ERA

N77-33307# Bhabha Atomic Research Centre, Bombay (India). Spectroscopy Div.

ANALYSIS OF GASES IN METALS: THE dc ARC GAS CHROMATOGRAPHIC TECHNIQUE. PART 4: SIMULTANEOUS DETERMINATION OF H2, O2, AND N2 IN METALS USING ARGON AS INERT GAS MEDIUM

P. K. Wahi and S. S. Biswas 1975 13 p refs
(BARC-800-Pt-4) Avail: NTIS HC A02/MF A01

A method for the simultaneous determination of H2, O2, and N2 in metals was developed employing a beta ray ionization detector which makes use of the indigenously available argon as a carrier gas. Detection limits for H2, O2, and N2 are 2 gamma, 10 gamma, and 10 gamma respectively. With a sample volume of three ml, the standard curves were linear in the concentration range 0 to 25 gamma (H2), 0 to 80 (N2) and 0 to 150 gamma (O2). The standard deviation varies from plus or minus 12 percent near the low concentration end to plus or minus five percent at the higher concentration end of the linear range. Preliminary studies show that nickel could be used as a bath material instead of platinum for the extraction of O2 from zirconium metal. ERA

N77-33308# Institut Franco-Allemand de Recherches, St. Louis (France).

MASS SPECTROMETRIC MEASUREMENT OF VELOCITY DISTRIBUTIONS OF NITROGEN MOLECULES IN THE EXPANSION GAS OF LEAD AZIDE AFTER ULTRAHIGH VACUUM DETONATION [MASSENSPEKTROMETRISCHE MESSUNG DER GESCHWINDIGKEITSVERTEILUNGEN VON STICKSTOFFMOLEKUELEN IN DEN EXPANSIONS-SCHWADEN VON BLEIAZID NACH DER DETONATION IM HOCHVAKUUM]

F. Aulinger and A. Hoeh 11 Mar. 1976 47 p refs In GERMAN
(ISL-R-108/76) Avail: NTIS HC A03/MF A01

The detonation and expansion behavior of metal azides was investigated using a molecular beam apparatus consisting of three differentially pumped high vacuum chambers. Individual gas components were detected in the explosion gas by means of a quadrupole mass filter and by oscillographic recording of ion beam time curves. Maximum expansion speeds between 4 and 10 km/s were found, with damping up to 12 km/s. ESA

N77-33309# National Bureau of Standards, Washington, D. C. Center for Fire Research.

THE MEASUREMENT OF FABRIC FLAMMABILITY PARAMETERS IN MOVEMENT SIMULATION EXPERIMENTS Final Report

E. A. Zawistowski, J. F. Krasny, E. Braun, R. Peacock, and N. William Jun. 1977 27 p refs
(PB-268902/4; NBSIR-77-1236) Avail: NTIS HC A03/MF A01 CSCL 13L

The flammability of cloth garments was studied. Fabrics were burned near a semicylinder which was covered by 54 heat sensors. The areas which received various heat loads (corresponding to various depth of burn injury in real-life flammable garment accidents) were recorded. In most cases, the semicylinder was moved during the burn, so that the burning fabrics made contact with it, simulating movement by the victim during a garment burn. This caused rapid extinguishment in some but not all fabrics. Results are reported for 40 fabrics varying in fiber content, and fabric construction and weight. GRA

N77-33310# Maryland Univ., College Park. Dept. of Textiles and Consumer Economics.

EXTINGUISHABILITY AS A COMPONENT MEASURE OF FLAMMABILITY HAZARDS Final Report, Jun. 1975 - Oct. 1976

S. M. Spivak, I. Block, B. F. Smith, K. Yeh, G. R. Bhat, R. L. Sun, L. Miles, P. Fairall, and P. Potthoff Apr. 1977 180 p refs
(Grant NBS-4-9019)
(PB-269489/1; NBS-GCR-77-90) Avail: NTIS HC A09/MF A01 CSCL 11E

Extinguishability of 22 flammable fabrics was investigated under a separate basic and applied phase. The basic phase focused on the influence of extinction mechanisms which control burning behavior during extinguishment, and thus extinguishability Mechanisms studied include effects of ambient oxygen concentration and placement of a heat sink in proximity to the flame. A modified flammability analyzer was used. Results show the burning rate and heat flux vary linearly with oxygen concentration. The applied phase concentrated on laboratory simulations of extinguishment strategies, i.e., slapping out the flames and running to blow out the flames. GRA

N77-33311# Technical Audit Associates, Inc., New York.

AN ASSESSMENT OF THE LINKAGE OF RESEARCH IN ELECTROCHEMISTRY WITH ITS RAMIFICATIONS FOR INDUSTRY Final Report

Frank B. Jewett, Jr. May 1977 44 p
(Grant NSF PRM-77-SP-0553)
(PB-269224/2) Avail: NTIS HC A03/MF A01 CSCL 07D

The general objective of this assignment was to use electrochemical research and its impact on industry as a case study to determine if NSF policies and funding criteria could be made more effective in supporting industrial objectives that would benefit the national well-being. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N77-33312 Miami Univ., Coral Gables, Fla.

THE CORROSION KINETICS OF COPPER IN AQUEOUS AMINO ACID AND CARBOXYLIC ACID SOLUTIONS Ph.D. Thesis

David Allan Kramer 1976 130 p
Avail: Univ. Microfilms Order No. 77-13925

Polarization resistance measurements, at low over-voltages, of copper corrosion in aerated aqueous solutions containing a series of amino acids and a series of dicarboxylic acid solutions are described. All of the solutions were brought to a constant ionic strength of 0.7M KNO3 and mantained at pH7. Corrosion acceleration of both types of acids occurred by a mechanism which involved reactions under anodic control and the oxidation of copper to Cu(+2). The mechanism also involved the formation of cyclic structures. Amino acids accelerate the corrosion of copper by a mechanism in which they are adsorbed on the metal surface, whereas dicarboxylic acids accelerate without being adsorbed. Dissert. Abstr.

N77-33313*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

BURNER RIG ALKALI SALT CORROSION OF SEVERAL HIGH TEMPERATURE ALLOYS

D. Deadmore and C. Lowell 13 May 1977 20 p refs Presented at the 151st Meeting of the Electrochemical Soc., Inc., Philadelphia, 8-13 May 1977
(NASA-TM-X-73659; E-9176) Avail: NTIS HC A02/MF A01 CSCL 11F

The hot corrosion of five alloys was studied in cyclic tests in a Mach 0.3 burner rig into whose combustion chamber various aqueous salt solutions were injected. Three nickel-based alloys, a cobalt-base alloy, and an iron-base alloy were studied at temperatures of 700, 800, 900, and 1000 C with various salt concentrations and compositions. The relative resistance of the alloys to hot corrosion attack was found to vary with temperature and both concentration and composition of the injected salt solution. Results indicate that the corrosion of these alloys is a function of both the presence of salt condensed as a liquid on

the surface and of the composition of the gas phases present.
Author

N77-33314*# Syracuse Univ., N. Y. George Sachs Fracture and Fatigue Research Lab.
FATIGUE CRACK GROWTH AT ELEVATED TEMPERATURE 316 STAINLESS STEEL AND H-13 STEEL
Wen-Ching Chen and H. W. Liu [1976] 56 p refs
(Grant NGR-33-022-157)
(NASA-CR-135105; MTS-HWL-4116-776) Avail: NTIS HC A04/MF A01 CSCL 11F

Crack growths were measured at elevated temperatures under four types of loading: pp, pc, cp, and cc. In H-13 steel, all these four types of loading gave nearly the same crack growth rates, and the length of hold time had negligible effects. In AISI 316 stainless steel, the hold time effects on crack growth rate were negligible if the loading was tension-tansion type; however, these effects were significant in reversed bending load, and the crack growth rates under these four types of loading varied considerably. Both tensile and compressive hold times caused increased crack growth rate, but the compressive hold period was more deleterious than the tensile one. Metallographic examination showed that all the crack paths under different types of loading were largely transgranular for both CTS tension-tension specimens and SEN reversed cantilever bending specimens. In addition, an electric potential technique was used to monitor crack growth at elevated temperature. Author

N77-33315*# Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.
MECHANICAL PROPERTIES OF SEVERAL NICKEL ALLOYS IN HYDROGEN AT ELEVATED TEMPERATURES Final Report
John R. Warren, John A. Harris, Jr., and M. C. Vanwanderham Sep. 1977 66 p
(Contract NAS8-30744)
(NASA-CR-150412; FR-8971) Avail: NTIS HC A04/MF A01 CSCL 11F

Tests were performed to determine low cycle fatigue and crack growth rate properties of one iron-base and two forms of one cast nickel-base alloy. The alloys were tested in various forms and/or heat-treat conditions that are proposed for use in a high-pressure hydrogen or a hydrogen-water vapor environment. Some general conclusions can be made comparing the results of tests in a hydrogen environment with those in a hydrogen-water vapor environment. The hydrogen-water vapor environment caused a 50 percent average reduction in fatigue life, indicating extreme degradation when compared with tests conducted in air, for Incoloy 903 at 1033 K (1400 F). Crack growth rates increased significantly for all materials with increasing test temperature. A very significant increase (three orders of magnitude) in crack growth rate occurred for Incoloy 903 tested in the hydrogen-water vapor environment when compared with testing done in hydrogen along at 922 K (1200 F). Author

N77-33316*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE 100,000-HOUR CYCLIC OXIDATION BEHAVIOR AT 815 C (1500 F) OF 33 HIGH-TEMPERATURE ALLOYS
Charles A. Barrett 1977 9 p refs Presented at Environ. Effects and Degradation of Eng. Mater. Conf., Blacksburg, Va., 10-12 Oct. 1977; sponsored by Va. Polytech. Inst.
(NASA-TM-73707; E-9245) Avail: NTIS HC A02/MF A01 CSCL 11F

Commercial high-temperature Fe-, Ni-, and Co-base alloys were oxidized in air at 815C for ten 1000-hour cycles. Specific weight change versus time curves were derived and the 10,000-hour surface oxides were analyzed by X-ray diffraction. The alloys were ranked by a combination of appearance and metal loss estimates derived from gravimetric data. Author

N77-33317# Electrochemical Technology Corp., Seattle, Wash.
REACTIONS AND ELECTROCHEMICAL KINETICS OF NEWLY-GENERATED METAL SURFACES Final Report, 1 Jul. 1975 - 31 Aug. 1976
Theodore R. Beck Nov. 1976 34 p refs
(Contract F44620-76-C-0001; AF Proj. 6813)
(AD-A036570; AFOSR-77-0121TR) Avail: NTIS HC A03/MF A01 CSCL 07/4

Air Force flight vehicles must withstand increasingly complex environmental and operational regimes. Fundamental knowledge of the mechanisms of fatigue and fracture of flight structures is required. This research is related to the understanding of crack propagation, stress corrosion and corrosion fatigue in titanium and other metals. An electrochemical mass transport kinetic (MTK) model was previously formulated by the author to quantitatively describe the electrochemical events in a crack. It turned out that the model was not completely accurate because initial reactions on a newly-generated surface of titanium such as at the crack tip were not understood at that time. All electrochemical studies reported in the literature were for aged surfaces of titanium which had an oxide skin. The present work was done to fulfill the requirement of the model for quantitative data on new titanium surfaces and to develop a general understanding of the kinetics of the repassivation process. The MTK model is in the process of revision to include titanium dissolution and formation of a salt film at the crack tip, based on the above experiments. Passivation kinetics of new surfaces of aluminum and zirconium were also determined. GRA

N77-33318# Army Materials and Mechanics Research Center, Watertown, Mass.
POWDER PROCESSING OF TRIP STEEL Final Report
Saul Isserow Apr. 1977 19 p refs
(AD-A041069; AMMRC-TR-77-12) Avail: NTIS HC A02/MF A01 CSCL 11/6

Prealloyed powder of a TRIP steel alloy was prepared by the rotating electrode process. The powder was consolidated to bar stock by extrusion at 1800 or 2000 F. The bar stock was rolled at 850 F to a series of reductions up to 80% with and without intermediate solutionizing. Rolled strips were evaluated in tension tests, which showed the capability of suitably processed powder to achieve the combination of high strength and ductility demonstrated in cast/wrought stock. Stock prepared by extrusion of powder at 2000 F was outstanding in strength, elongation, and reduction of area when warm rolled at 850 F directly from extrusion without intermediate solutionizing. The mechanical behavior of powder subjected to the various combinations of extrusion and solutionizing can be understood with the help of the metallographic observations. The 1800 F extrusion contains substantial precipitates, presumably carbides, which are detrimental to mechanical behavior. Solutionizing removes these carbides, providing material similar to cast/wrought stock as prepared for the warm rolling. The 2000 F extrusion has solutionized structure, not amenable to improvement by a subsequent solutionizing anneal. Author (GRA)

N77-33319# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
A STUDY OF CONSTITUENT, DISPERSOID, AND HARDENING PARTICLES IN THE FRACTURE OF 7075 ALUMINUM ALLOYS Final Report, Jul. 1975 - Feb. 1976
Joseph S. Santner Mar. 1977 43 p refs
(AD-A041421; AFML-TR-76-200) Avail: NTIS HC A03/MF A01 CSCL 11/6

Ten different alloys based on the 7075 composition are used to study the effect of purity level, dispersoid type, and heat treatment on 7075's fracture toughness. Five different purity levels ranging from 0.30 w/o to 0.30 w/o Fe-Si and two different dispersoid types were investigated. Each alloy was given two different heat treatments with both the longitudinal and the long-transverse directions tested. The notched round tensile test was modified to give the 'plastic energy per unit area'. This parameter used for ranking fracture toughness gave the same results as the total energy per unit area measured on precracked Charpy specimens. Moreover, the fracture toughness ranking for these ten alloys was the same in the longitudinal and long-transverse directions. This suggests the elongated distribution of constituent particles in the rolling direction does not change the failure mechanism. Fractographic evidence showed a clear difference in the fracture topography between the ten alloys. An analysis of variance demonstrated that heat treatment was the most significant variable investigated that affects fracture toughness. This result supports a two-stage ductile fracture failure mechanism which suggests that the dispersoid and hardening particles are primarily responsible for the fracture

toughness of the higher purity aluminum alloys used by the aerospace industry today. Author (GRA)

N77-33320# Textron Bell Aerospace Co., Buffalo, N. Y.
CATHODIC KINETICS DURING CORROSION OF 5456-H117 ALUMINUM ALLOY BY HIGH VELOCITY SEA WATER
J. A. Davis (Allegheny Ludlum Steel Corp.), G. A. Gehring, Jr. (Ocean City Res. Corp.), and A. A. Watts 1977 25 p refs Proposed for presentation at 7th Intern. Congr. on Metallic Corrosion, Rio de Janeiro, Oct. 1978
(Contract N00014-75-C-1087)
(AD-A041218) Avail: NTIS HC A02/MF A01 CSCL 11/6

The purpose of this investigation was to measure limiting oxygen diffusion current densities as a function of velocity, to study cathodic kinetics on 5456-H117 aluminum alloy as a function of velocity and to conduct constant potential tests at more active potentials than -0.9 V(SCE). Constant potential tests were conducted at selected velocities at potentials more active than -0.9V(SCE) to determine if pitting could be suppressed at the more active potentials. Finally, a model was proposed to explain the observations from this and previous studies. GRA

N77-33321# Texas Univ., Austin. Dept. of Mechanical Engineering.
THE EFFECT OF GRAIN SIZE ON THERMAL DIFFUSION IN METALS Final Report, 1 Jun. 1972 - 31 May 1977
J. P. Stark 1 Jun. 1977 13 p refs
(Grant AF-AFOSR-2342-72)
(AD-A041532; AFOSR-77-0765TR) Avail: NTIS HC A02/MF A01 CSCL 11/6

This research was concerned with evaluation of the segregation of substitutional solutes in metal alloys resulting from the application of a temperature gradient. Metallurgical structure, namely grain size, is known to be an important factor in solute redistribution. Measurements were made to evaluate the influence of this parameter. Namely, it has been shown that grain size controls the non-equilibrium concentration of vacancies which in turn influence solute fluxes. Author (GRA)

N77-33322# Illinois Univ., Urbana-Champaign. Dept. of Metallurgy and Mining Engineering.
MECHANISM OF STRESS-CORROSION CRACKING Final Report, 1 Mar. 1974 - 28 Feb. 1977
E. Neville Pugh Jun. 1977 16 p refs
(Grants DAHC04-74-G-0127; DAAG29-76-G-0177)
(AD-A042106; ARO-12062.2-MS) Avail: NTIS HC A02/MF A01 CSCL 11/6

A study has been made of the corrosion and SCC of copper and alpha-phase Cu-Zn alloys in 1N ammoniacal solutions. Potentiostatic experiments confirmed that the corrosion process in non-tarnishing solutions is under concentration polarization, being controlled by the transport of the main cathodic species (cupric complex ions) to the surface, and established the reversible potential, the exchange current density and the Tafel slope for the main anodic reaction, copper dissolution. The conditions for tarnish formation and the nature of this cuprous-oxide layer were also studied. Potentiostatic studies of the potential dependence of SCC of annealed Cu-30Zn established that the critical potential for cracking corresponds to the reversible potential for copper dissolution. Moreover, SCC was shown to be predominantly intergranular in potential ranges where tarnishing occurs and transgranular in non-tarnishing ranges. These and other observations lend support to our view that inter- and transgranular SCC involve different mechanisms. The former is considered to occur by the film-rupture model. The mechanism of transgranular cracking has not been established, but fractographic and accoustic-emission studies of both Cu-30Zn and Admiralty Metal indicated that this form of cracking occurs by discontinuous cleavage on (110) planes. Author (GRA)

N77-33323# California Univ., Los Angeles. Dept. of Materials.
THEORETICAL INVESTIGATION OF ANOMALOUS PROPERTIES OF BCC, Ti, Zr, AND Hf ALLOYS Final Report, 1 May 1973 - 31 Jul. 1976
D. DeFontaine 1 Jun. 1977 29 p refs
(Grants DA-ARO(D)-31-124-73-G160; DAHC04-74-G-0183; DAHC04-76-G-0018)
(AD-A042108; UCLA-ENG-7741; ARO-11286.2-MG; ARO-13148.1-MS23) Avail: NTIS HC A03/MF A01 CSCL 11/6

A model for anomalous self-diffusion in the bcc-phase Group IV B transition metals, Ti, Zr and Hf is proposed. The model is based upon the identity of the activation complex for vacancy diffusion in the bcc lattice and the smallest unit (omega embryo) of a hexagonal phase, the omega phase, found in these metals and their alloys in a metastable state. The coefficient for self-diffusion is calculated as a function of temperature by means of a phenomenological expression for the free energy of formation of an omega embryo, and by means of a more fundamental approach based on Kikuchi's Cluster Variation method. The two methods of calculation for the self-diffusion coefficient of Zr give excellent agreement with experiment, the observed curvature of the Arrhenius plot being reproduced perfectly. GRA

N77-33324# Bell Aerospace Co., Buffalo, N. Y.
CATHODIC KINETICS DURING CORROSION OF 5456-H117 ALUMINUM ALLOY BY HIGH VELOCITY SEA WATER Final Report
A. A. Watts, J. A. Davis, and G. A. Gehring, Jr. Jun. 1977 27 p refs
(Contract N00014-75-C-1087)
(AD-A041724) Avail: NTIS HC A03/MF A01 CSCL 11/6

The purpose of this continuing investigation was to measure limiting oxygen diffusion current densities as a function of sea water velocity, to study cathodic kinetics on 5456-H117 aluminum alloy as a function of velocity and to conduct constant potential tests at more active potentials than -0.9 VSCE. Finally, a model was proposed to explain the observations from this and previous studies. GRA

N77-33325# Naval Postgraduate School, Monterey, Calif.
LASER INDUCED DESORPTION OF GAS FROM STAINLESS STEEL SURFACES M.S. Thesis
James Stanley Polk Jun. 1977 68 p refs
(AD-A042323) Avail: NTIS HC A04/MF A01 CSCL 07/4

Laser induced desorption of gases from stainless steel target surfaces in vacuum of the order of 10 to the -7th power Torr was studied as a special case of photon-induced desorption. Adsorption phenomena and induced desorption were examined with emphasis on desorption caused by direct photon excitation and photon-induced thermal effects. The photon sources employed were infrared laser pulses with intensities of the order of 10 MW/sq cm produced by a Q-switched Nd-glass laser. Total pressure and mass spectrometric partial pressure measurements of hydrogen, carbon dioxide, and nitrogen/carbon monoxide were taken. The results indicated that laser induced desorption is principally a thermal mechanism. Desorption energies derived from measured partial pressure changes and calculated surface temperature increases were found to be 8.5 kcal/mole for hydrogen and 14.7 kcal/mole for carbon dioxide. Author (GRA)

N77-33326# Westinghouse Electric Corp., Pittsburgh, Pa. Advanced Energy Systems Div.
INVESTIGATION OF METAL PROCESSING OPERATIONS Final Report, 15 Dec. 1973 - 22 Mar. 1977
F. J. Gurney Apr. 1977 87 p refs
(Contract F33615-74-C-5059)
(AD-A042188; AFML-TR-77-75) Avail: NTIS HC A05/MF A01 CSCL 11/6

This report summarizes the findings of several investigations involving the influence of process variables on the production of shapes with specified geometry, controlled microstructure and controlled structural integrity. The studies include the room temperature strengthening influence of grain boundary and subgrain boundary effects resultant from deformation of aluminum alloys; the microstructure and mechanical properties of extrusion consolidated 7075 Al powder; evaluation procedures for determining characteristics of workpiece coatings for isothermal forging; and the development and evaluation of separation-lubrication substances for titanium isothermal forging operations. Information derived from these investigations was applied to the processing of numerous experimental metalworking operations related to other alloy and processing development programs of interest to the Air Force and other government agencies.
Author (GRA)

N77-33327# Harco Corp., Medina, Ohio.
INVESTIGATION AND STATUS REPORT ON CONCENTRIC NEUTRAL CORROSION OF URD EXTRUDED CABLE Final Report
B. Husock, F. E. Rizzo, and D. H. Kroon Jan. 1977 234 p refs
(EPRI-EL-362) Avail: NTIS HC A11/MF A01

The use of cables with extruded insulation and concentric neutral wires for underground distribution was investigated. A compilation of information obtained from a literature search and a field investigation is presented. Results obtained in corrosion surveys of underground residential distribution (URD) cables are also included. The study concentrated on ascertaining present opinions about the cause of concentric neutral corrosion and on determining present industry practice in corrosion mitigation. No general agreement about the cause of concentric neutral corrosion was found and there was disagreement about the extent and seriousness of the problem. It is concluded that the neutral corrosion results from either stray dc currents or natural galvanic action and that ac is not an important factor. ERA

N77-33328# Brookhaven National Lab., Upton, N. Y.
INTERGRANULAR STRESS CORROSION CRACKING OF SENSITIZED STAINLESS STEELS Final Report
B. Vyas, H. S. Isaacs, and J. R. Weeks Dec. 1976 51 p refs
(Contract EY-76-C-01-0016)
(BNL-NUREG-50596) Avail: NTIS HC A04/MF A01

The intergranular stress corrosion cracking of materials used in boiling water reactors was studied. The mechanism(s) of this mode of failure and tests to determine the susceptibility of a given material to this form of attack were emphasized. ERA

N77-33329# California Univ., Berkeley. Lawrence Berkeley Lab.
MULLITE PHASE EQUILIBRIA IN THE SYSTEM: CaO-Al2O3-SiO2
V. F. Draper Oct. 1976 80 p refs
(Contract W-7405-eng-48)
(LBL-5706) Avail: NTIS HC A05/MF A01

Sapphire-liquid diffusion couples annealed in sealed molybdenum crucibles in the temperature range of 1602 C to 1787 C were analyzed by electron beam microprobe. Interfacial compositions across the phase boundaries were used to determine the stable composition range of the mullite phase field and the location of the mullite-corundum boundary. Experiments utilizing quenching methods were also conducted to establish the extent that the mestastable nature of the Al2O3-SiO2 system extended into the ternary CaO-Al2O3-SiO2 system and to determine any solid solubility of CaO in mullite. Further evidence was obtained to confirm the recognized value of approximately 82.5 wt percent Al2O3 as the upper solubility limit for metastable disordered mullite in the binary Al2O3-SiO2 system. ERA

N77-33330# California Univ., Berkeley. Lawrence Berkeley Lab.
SINTERING OF Al2O3 POWDER COMPACT BY HOT STAGE SCANNING ELECTRON MICROSCOPY Ph.D. Thesis
D. N. K. Wang Dec. 1976 144 p refs
(Contract W-7405-eng-48)
(LBL-5763) Avail: NTIS HC A07/MF A01

This work has used a constant heating rate technique to study MgO-doped and undoped Al2O3 powder compacts with variations in green density. Hot stage scanning electron microscopy was used to monitor continuously the linear dimensional change of a powder compact throughout the densification process at various constant heating rates. Extensive studies on the microstructural evolution were made and correlated with the densification and grain growth kinetics. The maximum densification rate was found to occur at a critical density which was independent of the heating rate as long as the green density remained constant. Microstructural evolution was correlated with the densification rate to explain the occurrence of the maximum rate of densification. The effect of MgO dopant on the densification and grain growth of Al2O3 compacts was also studied. It was found that there is no effect of MgO dopant on either process until the critical density is reached. ERA

N77-33331# California Univ., Berkeley. Lawrence Berkeley Lab.
DEFORMATION BEHAVIOUR OF Ti-50.3 AT Ni ALLOY
H. A. Mohamed Sep. 1976 11 p refs Presented at 4th Intern. Conf. on Strength of Metals and Alloys, Nancy, France, 30 Aug. 1976
(Contract W-7405-eng-48)
(LBL-5103; Conf-760804-7) Avail: NTIS HC A02/MF A01

It was found that stress induced twin-boundary migration within existing martensite variants, migration of twin boundaries between twin-related adjacent martensite variants, reorientation of existing martensite by twinning on the most favorably oriented twin system, and additional transformation at the expense of retained high temperature phase. ERA

N77-33332# Hanford Engineering Development Lab., Richland, Wash.
DISPLACEMENT CROSS SECTIONS AND PKA SPECTRA: TABLES AND APPLICATIONS
D. G. Doran and N. J. Graves Dec. 1976 127 p refs
(Contract EY-76-E-14-2170)
(HEDL-TME-76-70) Avail: NTIS HC A07/MF A01

Damage energy cross sections to 20 MeV are given for aluminum, vanadium, chromium, iron, nickel, copper, zirconium, niobium, molybdenum, tantalum, tungsten, lead, and 18Cr10Ni stainless steel. Primary knockon atom (PKA) spectra are given for aluminum, iron, niobium, tantalum, and lead for neutron energies up to 15 MeV at approximately one-quarter lethargy intervals. The contributions of various reactions to both the displacement cross sections (taken to be proportional to the damage energy cross section) and the PKA spectra are presented graphically. Spectral-averaged values of the displacement cross section are given for several spectra. Flux values are included to permit estimation of displacement rates. ERA

N77-33333# Oak Ridge National Lab., Tenn.
ROLE OF STRESS EFFECTS IN THE OXIDATION BEHAVIOR OF HIGH TEMPERATURE ALLOYS
J. V. Cathcart 1976 25 p refs Presented at Electrochem. Soc. Meeting, Las Vegas, Nev., 17 Oct. 1976
(Contract W-7405-eng-26)
(CONF-761057-4) Avail: NTIS HC A01/MF A01

Factors important in stress generation are considered, and several stress relaxation mechanisms are discussed. The importance of the interaction between stress generation and relaxation mechanisms is emphasized. ERA

N77-33334# Oak Ridge Y-12 Plant, Tenn.
CORROSION BEHAVIOR OF ALUMINUM IN WATER
C. R. Schmitt, J. M. Schreyer, and J. M. Googin 8 Feb. 1977 13 p refs
(Contract W-7405-eng-26)
(Y-DA-7055) Avail: NTIS HC A02/MF A01

A condensed and paraphrased summary of pertinent literature regarding the corrosion of aluminum in water is presented. Corrosion resistance and pitting are considered primarily. Also the effects of deposits and the various corrosive substances including the effects from living organisms are discussed. ERA

N77-33335# Washington Univ., St. Louis, Mo. Materials Research Lab.
A TREATMENT OF THE SUBJECT OF TEARING INSTABILITY Final Report
P. C. Paris, Hiroshi Tada, Akram Zahoor, and Hugo Ernst 11 Jul. 1977 93 p refs
(Contract NRC-03-77-029)
(PB-270277/7; NUREG-0311; NRC-3) Avail: NTIS HC A05/MF A01 CSCL 11F

An analysis of the subject of tearing instability of low strength steels is presented. An intensive theoretical treatment of the subject was taken and an initial experimental exploration and verification of the theory was made. The analysis showed that tearing instability, or abrupt cracking above the materials transition temperature is controlled by a newly defined material property, T, the tearing modulus. The 3-point bending tests demonstrated that T is the controlling parameter for instability under fully plastic plane strain conditions. GRA

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N77-33336 Brown Univ., Providence, R. I.
ELECTRONIC STRUCTURE OF BIOPOLYMERS Ph.D. Thesis
James Stanley Balcerski 1976 131 p
Avail: Univ. Microfilms Order No. 77-14085

Three types of biopolymers were examined: oligopeptides, polysaccharides, and polynucleotides. The vacuum ultraviolet circular dichroism (VUCD) spectra of four oligopeptides were obtained. The results indicate that the alanine series take up the antiparallel beta-conformation while the valine series assume the parallel beta-conformation. Norvaline and leucine appear to have a mixture of both conformations. These conformational assignments are consistent with the observed absorption data and the data obtained by IR spectroscopy. The VUCD spectrum of a polysaccharide, iota-carrageenan, was also examined. Two bands, a negative CD band at 180 nm and a larger positive CD band at 164 nm, were observed. These bands seem to arise from separate monomeric transitions. Dissert. Abstr.

N77-33337 Rensselaer Polytechnic Inst., Troy, N. Y.
POLYMER-SOLVENT INTERACTIONS AND DIFFUSION IN CONSTRAINED ELASTOMERS Ph.D. Thesis
William Michael Warner 1976 291 p
Avail: Univ. Microfilms Order No. 77-13700

The present study is an attempt to investigate the interactions of various liquids (solvents) with lightly crosslinked elastomers without the conformational entropic changes which accompany unrestrained swelling of a polymer. The measured variables in the constant volume apparatus were liquid absorption and pressure generation as functions of time. Most of the data were taken for natural rubber and various polar and nonpolar solvents at 25 C and a solvent hydraulic head of 100 psia. Some information on cis-polybutadiene and three styrene-butadiene random copolymers is also included. Prolonged liquid absorption by the constrained elastomer sample results in an equilibrium pressure, and an equilibrium amount of liquid in the sample. Dissert. Abstr.

N77-33338 New York Univ., N. Y.
POLYMERIZATION OF METHYL METHACRYLATE INITIATED BY t-BUTYL HYDROPEROXIDE IN THE PRESENCE OF METAL ACETYLACETONATES Ph.D. Thesis
C. J. Shahani 1977 185 p
Avail: Univ. Microfilms Order No. 77-13669

The effect of small concentrations of Cu(II), Co(III), Mn(II), Mn(III), Cr(III), Ni(II) and Al(III) on t-butyl hydroperoxide initiated polymerization of methyl methacrylate was studied in 1-chlorooctane medium. The progress of the reactions was followed by a periodical determination of hydroperoxide concentration and polymer content. In order to evaluate initiator efficiencies, the number average molecular weight of the isoleted polymer samples was also determined. While Cu(II), Co(II), CO(III) and Mn(III) acetylacetonates are seen to catalyze the decomposition of t-butyl hydroperoxide, only the Cu(II) complex catalyzes the polymerization of methyl methacrylate. Cobalt(II) acetylacetonate retards the polymerization reaction. Dissert. Abstr.

N77-33339 Connecticut Univ., Storrs.
HETEROGENEOUS ACID CATALYSIS BY POLYMER COLLOIDS Ph.D. Thesis
William Thomas McCarvill 1977 159 p
Avail: Univ. Microfilms Order No. 77-14480

Polystyrene latexes of small particle size stabilized by strong surface acid groups were prepared using the persulfate/bisulfite/iron (PBI) and bisulfite/iron (BI) initiators. The PBI initiator yields two types of surface strong acid end-groups, hydrolyzable sulfate ester, and nonhydrolyzable sulfonate. The BI initiator yields only the sulfonate end-groups. Surfactant employed to prepare small particle size latexes was found to graft onto the surface of the latex particle. Sodium dodecyl sulfate contributes fixed sulfate ester surface acid groups, and sodium dodecyl sulfonate contributes sulfonate surface acid groups. The sulfate end-groups contributed by either initiator or surfactant were found to be hydrolyzed by contact with ion-exchange resin and also underwent autocatalyzed hydrolysis. Dissert. Abstr.

N77-33340 Massachusetts Univ., Amherst.
CRYSTALLIZATION-INDUCED REACTION OF AROMATIC COPOLYESTERS Ph.D. Thesis
Alan Norman Schuler 1977 179 p
Avail: Univ. Microfilms Order No. 77-15118

The effect of reaction parameters on the extent of reorganization of random poly(ethylene terephthalate-cosuccinate) (PET/ES) copolyesters accomplished by crystallization-induced reaction was studied. Analysis of sequence length changes was performed using the NMR technique. To verify the accuracy of the NMR analysis an independent method of monomer analysis was developed. The copolyesters were saponified and monomer composition, determined by gas chromatographic analysis of the trimethyl silyl derivatives of the saponification products. Comparison of results of these two analysis demonstrated that the NMR method was accurate to + or - 1% for the copolyesters employed. Dissert. Abstr.

N77-33341 State Univ. of New York, Albany.
SYNTHESIS OF 1,9,10-ANTHYRIDINES AND ANNELATION FO 1,8-NAPHTHYRIDINE UNITS VIA FRIEDLANDER CONDENSATION Ph.D. Thesis
Thomas G. Majewicz 1976 141 p
Avail: Univ. Microfilms Order No. 77-14556

The Friedlander condensation offered a unique and facile synthesis of 1,9,10-anthyridines, but was limited by: the attack of base on the anthyridine skeleton, and the low solubility of the reaction products. The polycyclic anthyridines that were synthesized could be good model compounds for structure elucidation of black orlon. The synthesis of fused polycyclic compounds containing 1,8-naphthyridine units led to the observation of a new type of geometric stereoisomers, obtained by regioselective angular annelation. A series of oligomeric ladder structures were synthesized in which the direction of angular growth could be fully controlled. Dissert. Abstr.

N77-33342 Massachusetts Univ., Amherst.
SMALL-ANGLE X-RAY AND SMALL-ANGLE LIGHT SCATTERING STUDIES OF THE MORPHOLOGY OF POLYMER BLENDS Ph.D. Thesis
Farrokh Burjor Khambatta 1976 309 p
Avail: Univ. Microfilms Order No. 77-15091

The morphology of polymer blends using poly-episolon-caprolactone (PCL)/poly (vinyl chloride) (PVC) as a model system were studied by small-angle X-ray scattering (SALS). Blends of PCL/PVC were compatible for all compositions inspite of one of the components (PCL) crystallizing up to a composition of 50/50 (PCL/PVC). It was also established that the addition of PVC to PCL progressively impeded the crystallization of the ester and for compositions rich enough in PVC crystallization did not occur. Results of SAXS and SALS studies are consistent with the above observations regarding the trend and have moreover served to establish the morphological details on a more quantitative basis. Dissert. Abstr.

N77-33343 Connecticut Univ., Storrs.
BIODEGRADABLE POLYMER: SYNTHESIS AND CHARACTERIZATION OF ALPHA-BENZYLATED NYLONS AND RELATED POLYMERS Ph.D. Thesis
Koon-Wah Leong 1976 368 p
Avail: Univ. Microfilms Order No. 77-14475

A series of alpha-benzylated nylons were synthesized. Biodegradation, using pure proteolytic enzymes and microbes were conducted on these polymers. All the alpha-benzylated nylons, with the exception of one copolymer which contained 25% aromatic content, were resistant to biodegradation. Nylons containing methyl and hydroxy substituents on the diamine were found to support microbial growth. Poly (ureas) derived from methyl and ethyl ester of L-lysine were synthesized and were found to be hydrolysed by enzymes and they could be metabolized by micro-organisms. Gelatin was derivatized and cross-linked with various reagents; these polymers could be made into films and fibres, and they were biodegradable. Glycine was converted to

two ethylene glycol esters and they were polymerized with diisocyanate. Such polymers were found to be resistant to biodegradation. Dissert. Abstr.

N77-33344 Columbia Univ., New York.
DIRECTIONAL SOLIDIFICATION OF POLYMERS IN A TEMPERATURE GRADIENT Ph.D. Thesis
Andrew J. Lovinger 1977 209 p
Avail: Univ. Microfilms Order No. 77-14825

The technique consists of passing a sample at a constant rate through a temperature gradient high enough to create a molten zone. Traversal of the crystallizing interface through the polymer results in formation of oriented spherulites that may extend unidirectionally throughout the entire sample. Totally oriented spherulitic matrices that grow to unlimited lengths were found to be favored by high temperature gradients, high degrees of superheat in the melt, and low zone velocities. Directional solidification is very advantageous to the investigation of polymorphs such as isotactic poly(propylene). By inducing temperature sensitive growth transformations to directionally crystallizing alpha-(polypropylene), unlimited lengths of the faster growing beta-polymorph could be sustained in oriented form. Precise growth rate data were thus obtained, showing the beta-type to grow variably faster than the alpha-form, possibly as a result of its more open unit cell structure. Dissert. Abstr.

N77-33345 Connecticut Univ., Storrs.
THE SURFACE CHEMISTRY OF ACRYLIC POLYMER COLLOIDS Ph.D. Thesis
Chandrasen Gajria 1977 113 p
Avail: Univ. Microfilms Order No. 77-14462

Strong acid polymer end-groups, derived from the persulfate-bisulfite-iron (PBI) redox initiator, and present at the particle/aqueous interface, were found to catalyze the hydrolysis of surface polymer ester repeat units in polymer colloids of methyl methacrylate (MMA) and methyl acrylate (MA). The hydrolysis was observed to be a function of the surface acid concentration and occurred at measurable rates only with H(+) counterions. The kinetics of the ester hydrolysis were found to be pseudo zero-order. This is believed to result from the fact that the reaction occurs at the interface. The hydrolysis rate in polymer colloids of MMA was found to be independent of added N HCl and 0.02 M NaCl concentrations. The energy of activation for hydrolysis of MMA colloids was calculated to be 13.2 kcals/mole, and 11.8 kcals/mole for colloids of MA. Dissert. Abstr.

N77-33346 Massachusetts Univ., Amherst.
THE SYNTHESIS AND CHARACTERIZATION OF SELECTED COPOLYOXAMIDES WITH SPECIAL EMPHASIS ON THEIR COMPLEXATION BEHAVIOR Ph.D. Thesis
Allan Howard Beeber 1977 197 p
Avail: Univ. Microfilms Order No. 77-13777

Oligooxamides and precursors were characterized by infrared and proton magnetic resonance spectroscopy, and by elemental and thermal analysis. The majority melt with decomposition and char formation at temperatures above 250 C. The 1,8- and 1,5-anthraquinone and anthracene dicarboxylic acid chlorides and precursors have been characterized by infrared spectroscopy and melting point determinations. All diacid chlorides melt above 200 C. Most of the polymers form films and are soluble in concentrated sulfuric acid, trifluoroacetic acid, and dimethylacetamide (containing LiCl), are high melting (over 360 C. usually) and decompose during the melting process. The polymers were further characterized by measurements of elemental analysis, inherent viscosity, and infrared and PMR spectra. Dissert. Abstr.

N77-33347*# Springborn Labs., Inc., Enfield, Conn.
INVESTIGATION OF TEST METHODS, MATERIAL PROPERTIES AND PROCESSES FOR SOLAR CELL ENCAPSULANTS Annual Report
P. B. Willis and B. Baum Jul. 1977 164 p Sponsored in part by ERDA Prepared for JPL
(Contracts NAS7-100; JPL-954527)
(NASA-CR-155158; ERDA/JPL-954527-77/2) Avail: NTIS HC A08/MF A01 CSCL 11C

The potentially useful encapsulating materials for Task 3 of the Low-Cost Silicon Solar Array project were studied to identify, evaluate, and recommend encapsulant materials and processes for the production of cost-effective, long-life solar cell modules. Materials for study were chosen on the basis of existing knowledge of generic chemical types having high resistance to environmental weathering. The materials varied from rubbers to thermoplastics and presented a broad range of mechanical properties and processing requirements. Basic physical and optical properties were measured on the polymers and were redetermined after exposure to indoor artificial accelerated aging conditions covering four time periods. Strengths and weaknesses of the various materials were revealed and data was accumulated for the development of predictive methodologies. To date, silicone rubbers, fluorocarbons, and acrylic polymers appear to have the most promising combination of characteristics. The fluorocarbons may be used only as films, however, because of their high cost. Author

N77-33348*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
X-RAY PHOTOELECTRON SPECTROSCOPY STUDY OF RADIOFREQUENCY-SPUTTERED TITANIUM CARBIDE, MOLYBDENUM CARBIDE, AND TITANIUM BORIDE COATINGS AND THEIR FRICTION PROPERTIES
William A. Brainard and Donald R. Wheeler Oct. 1977 21 p refs
(NASA-TP-1033; E-9102) Avail: NTIS HC A02/MF A01 CSCL 11G

Radiofrequency sputtered coatings of titanium carbide, molybdenum carbide and titanium boride were tested as wear resistant coatings on stainless steel in a pin on disk apparatus. X-ray photoelectron spectroscopy (XPS) was used to analyze the sputtered films with regard to both bulk and interface composition in order to obtain maximum film performance. Significant improvements in friction behavior were obtained when properly biased films were deposited on deliberately preoxidized substrates. XPS depth profile data showed thick graded interfaces for bias deposited films even when adherence was poor. The addition of 10 percent hydrogen to the sputtering gas produced coatings with thin poorly adherent interfaces. Results suggest that some of the common practices in the field of sputtering may be detrimental to achieving maximum adherence and optimum composition for these refractory compounds. Author

N77-33349*# Rockwell International Corp., Anaheim, Calif. Electronic Devices Div.
DEVELOPMENT OF LOW COST, HIGH RELIABILITY SEALING TECHNIQUES FOR HYBRID MICROCIRCUIT PACKAGES, PHASE 2 Final Report
K. L. Perkins and J. J. Licari Aug. 1977 108 p
(Contract NAS8-31992)
(NASA-CR-150420; C76-597/201) Avail: NTIS HC A06/MF A01 CSCL 11A

Adhesives were evaluated to determine if they qualify for application to hybrid microcircuit packages. The effort consisted of the following: (1) seal gold-plated Kovar packages with selective adhesives and determine seal integrity after exposure to temperature humidity environments; (2) seal both gold-plated Kovar and ceramic packages with the four best adhesives identified in (1) and determine seal integrity after exposure to MIL-STD-883A test environments; and (3) subject the best adhesive identified in (2) to a 60 C/98% RH environment and determine susceptibility to moisture permeation. Test results are provided. G.D.H.

N77-33350*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FRICTION AND DEFORMATION BEHAVIOR OF SINGLE-CRYSTAL SILICON CARBIDE
Kazuhisa Miyoshi (Kanazawa Univ., Kanazawa, Japan) and Donald H. Buckley Oct. 1977 22 p refs
(NASA-TP-1053; E-9121) Avail: NTIS HC A02/MF A01 CSCL 20B

Friction and deformation studies were conducted with single-crystal silicon carbide in sliding contact with diamond. When the radius of curvature of the spherical diamond rider was large (0.3), deformation of silicon carbide was primarily elastic. Under these conditions the friction coefficient was low and did not show a dependence on the silicon carbide orientation. Further, there was no detectable cracking of the silicon carbide

surfaces. When smaller radii of curvature of the spherical diamond riders (0.15 and 0.02 mm) or a conical diamond rider was used, plastic grooving occured and the silicon carbide exhibited anisotropic friction and deformation behavior. Under these conditions the friction coefficient depended on load. Anisotropic friction and deformation of the basal plane of silicon carbide was controlled by the slip system. [1010]<1120>and cleavage of[1010]. Author

N77-33351*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FUNDAMENTAL CONSIDERATIONS FOR FUTURE SOLID LUBRICANTS
R. L. Johnson and H. E. Sliney 11 Sep. 1969 32 p refs
Presented at Conf. on Solid Lubricants, Kansas City, Mo. 9-11 Sep. 1969; sponsored by AFML and Midwest Res. Inst.
(NASA-TM-X-52659; E-5241) Avail: NTIS HC A03/MF A01 CSCL 11H

Properties important to the performance of solid lubricants are discussed. Those properties include shear characteristics, coherence between particles, resistance to cold flow, adherence to the substrate, applicable chemical thermodynamics and kinetics of materials and environments, polymorphism, and rheology. The following generalizations are made: (1) chemical thermodynamics and kinetics are powerful tools for use in determining the useful environments and methods of application for solid film lubricants; (2) the primary requirement for a solid lubricant is low shear strength; (3) the rheology of solid film constituents and formulations is likely to be of vital importance to performance and life; and (4) adherence and mobility of surface films is another primary requirement for long lived solid lubricants. Author

N77-33352# Army Armament Research and Development Command, Aberdeen Proving Ground, Md.
A MAGNETIC FLUID SEAL FOR MEASUREMENT OF AERODYNAMIC SURFACE PRESSURE Technical Report, Jan. - Jul 1976
Miles C. Miller Apr. 1977 33 p refs
(DA Proj. 1T1-61101-A-91A)
(AD-A040345; ARCSL-TR-77018; ED-TR-77019) Avail: NTIS HC A03/MF A01 CSCL 11/1

A magnetic-fluid sliding seal was designed, fabricated, and tested for application in a special instrumentation arrangement to measure the aerodynamic surface pressure on a spinning wind tunnel model. The seal was intended to provide a low-friction, airtight linear seal between stationary and rotating model components. A series of laboratory tests were conducted to evaluate the performance of the seal in relation to anticipated wind tunnel test conditions and possible model configurations. These tests involved measuring the maximum pressure that the seal was capable of holding at various model spin rates. The effects of certain seal parameters were investigated including: gap distance between stationary and moving components, magnetic-fluid properties (i.e., magnetization strength and viscosity), and ferrous versus nonferrous moving component material. These tests demonstrated that the seal was capable of holding a nominal pressure of 1 psi at a maximum sustained spin rate of 1250 rpm. This relates to a relative velocity between the moving and stationary components of 27 ft/sec. Higher pressures could be held at lower sustained spin rates and even under impulsive rotational conditions. The current seal design would appear to be applicable for this wind tunnel test techniques where extremely low friction is required. However, it would be limited to spin rates under 1000 rpm. Design trends are indicated to increase the seal performance for future applications.
Author (GRA)

N77-33353# United Technologies Research Center, East Hartford, Conn.
PRESSURELESS SINTERING OF SiAlON GAS TURBINE COMPONENTS Final Report, 23 Dec. 1975 - 23 Feb. 1977
George K. Layden 23 Feb. 1977 99 p refs
(Contract N62269-76-C-0108)
(AD-A041207; UTRC/R77-912532-4; NADC-75207-30) Avail: NTIS HC A05/MF A01 CSCL 13/8

Attempts were made to prepare Si(3-x)Al(X)O(x)N(4-x) beta: solid solution bodies by reacting X phase liquid and complimentary phase assemblages, and homogenizing these to single phase. Fully dense bodies were produced, but microstructural evidence suggested that some second phase material was retained in grain boundaries and controlled mechanical properties. GRA

N77-33354# Douglas Aircraft Co., Inc., Long Beach, Calif.
PRIMARY ADHESIVELY BONDED STRUCTURE TECHNOLOGY (PABST). PHASE IB: PRELIMINARY DESIGN Final Report, 19 Feb. 1975 - 15 Oct. 1976
Dec. 1976 465 p refs
(Contract F33615-75-C-3016; AF Proj. 486U)
(AD-A041536; AFFDL-TR-76-14123) Avail: NTIS HC A20/MF A01 CSCL 13/8

An extensive structural design concept formulation and evaluation effort was conducted culminating in the selection of three concepts which offered the greatest potential for acquisition cost, maintenance cost, and weight reduction from the baseline structure. From these three concepts, the design selected for continuation into Phase II, Detailed Design, was a combination close-spaced/wide-spaced, internal/external skin stringer design. Iterative analysis and design support by extensive environmental coupon and component testing constituted the balance of the preliminary design effort of Phase Ib. Two surface preparations were investigated and resulted in selection of phosphoric anodize. An immersion tank FPL etch was the reference standard. The adhesive systems considered were the new environmental resistant 250 F cure, modified epoxy adhesive and their respective primers. GRA

N77-33355# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
SYNTHESIS OF POLYIMIDES CURABLE BY INTRAMOLECULAR CYCLOADDITION Final Report, Sep. 1974 - Dec. 1975
Frederick L. Hedberg and Fred E. Arnold Mar. 1977 25 p refs
(AD-A041420; AFML-TR-76-198) Avail: NTIS HC A02/MF A01 CSCL 07/3

The concept of intramolecular cycloaddition (IMC) curing of polymers for use as matrix resins, previously established for polyphenylquinoxalines, has been extended to polyimides. Two novel aromatic diamines incorporating a 2,2'-bis (phenylethynyl) diphenyl moiety were synthesized and then polymerized with various bis-anhydrides. In the optimum combination, a polyimide was obtained which was soluble in aprotic solvents, softened at 185 C, underwent a cure at 233 C wherein the 2,2'-bis (phenylethynyl) diphenyl moiety was converted to a much more rigid dibenzoanthracene structure, and the resultant polymer displayed a softening point of 310-325 C after cure.
Author (GRA)

N77-33356# Utah Univ., Salt Lake City. Dept. of Chemistry.
RAMAN SCATTERING STUDIES OF CHAIN ORIENTATION IN HYDROSTATICALLY EXTRUDED POLYPROPYLENE
S. K. Satija, C. H. Wang, and H. Kanetsuna 8 Jun. 1977 28 p refs
(Contract N00014-75-C-0908)
(AD-A041096; TR-14) Avail: NTIS HC A03/MF A01 CSCL 07/4

Raman scattering is used in the study of hydrostatically extruded polypropylene as a function of the extrusion ratio. At a high extrusion ratio, polypropylene gives rise to Raman spectra with a well-characterized polarization behavior. This result has been used to supplement the symmetry assignments of normal vibrations in polypropylene. The intensity ratios and depolarization ratios have also been measured as a function of the extrusion ratio. The c-axis alignment of the polymer chain has been found to increase with the increase of the extrusion ratio. At the extrusion ratio equal to 6.3, about 90% of the polymer chains have been found to align along the direction of extrusion (the c-axis).
Author (GRA)

N77-33357# Pennwalt Corp., King of Prussia, Pa. Research and Development Dept.
THE SYNTHESIS AND CHARACTERIZATION OF THE POLY(METAL PHOSPHINATES). Final Report, 15 Oct. 1968 - 31 Mar. 1977
B. P. Block, H. D. Gillman, and P. Nannelli Jun. 1977 33 p
(Contract N00014-69-C-0122)

(AD-A041511) Avail: NTIS HC A03/MF A01 CSCL 07/2

A general investigation of the synthesis and characterization of poly(metal phosphinates), which covered a wide range of materials including numerous metal centers and bridging phosphinate groups, resulted in a much more comprehensive understanding of them, permitting their development for a variety of applications. Technical reports, publications, issued and allowed patents, and oral presentations are tabulated. Daughter contracts stemming from this fundamental program are also cited. Author (GRA)

N77-33358# Georgia Inst. of Tech., Atlanta. School of Textile Engineering.

PROTECTION OF NOMEX FROM ULTRAVIOLET DEGRADATION Technical Report, 1 Jul. 1964 - 28 Feb. 1976

Wayne C. Tincher, Walter C. Carter, and David R. Gentry Mar. 1977 155 p refs

(Contract F33657-74-C-0716)

(AD-A041494; E-27-623; ASD-TR-77-11) Avail: NTIS HC A08/MF A01 CSCL 11/5

A stabilizer system has been developed for Nomex fabrics and webbing to reduce UV degradation. Treated fabric samples retain greater than 75% of the initial tensile strength after 150 hours exposure to the Sunshine Arc Fade-Ometer compared to less than 50% retention for untreated samples. The treatment system contains Blancophor AW, Tinuvin P, and oxanilide and may be applied to fabrics from an aqueous emulsion at 265 F by means of an acetophenone based carrier. Author (GRA)

N77-33359# Georgia Inst. of Tech., Atlanta. School of Textile Engineering.

INVESTIGATION OF FABRIC WEAVE CONSTRUCTION VERSUS TEAR RESISTANCE Final Report, Apr. 1976 - Jun. 1977

L. Howard Olson 13 Jun. 1977 95 p refs

(Contract DAAG53-76-C-0141)

(AD-A041259; E-27-640) Avail: NTIS HC A05/MF A01 CSCL 11/5

This investigation was directed at identifying those factors of weave construction which enhance fabric tear resistance, and producing and testing fabric samples to determine conditions for optimum performance. A thorough literature survey on fabric tear resistance was conducted. The literature indicated that yarn strength and yarn mobility, related to fiber strength and woven fabric geometry, directly affect fabric tear strength. GRA

N77-33360# General Electric Co., Schenectady, N. Y.

LEAD ZIRCONATE TITANATE (LZT) CERAMICS Annual Summary Report, 1 May 1976 - 30 Apr. 1977

J. H. Rosolowski, R. H. Arendt, and J. W. Szymaszek Jun. 1977 43 p refs

(Contract N00014-76-C-0659)

(AD-A041507; SRD-77-102) Avail: NTIS HC A03/MF A01 CSCL 11/2

A method of producing fully reacted, homogeneous lead zirconate titanate powders including all the technologically important property modifying additives is described. The method involves reacting mixture of powders of the components together with a eutectic NaCl-KCl mixture at a temperature where the salt is molten. The properties of piezoelectric ceramics made of such powders are compared to data from ceramics fabricated from powder made by calcination. Ceramics made from molten salt synthesized powders generally had a lower dissipation factor and higher mechanical Q. Author (GRA)

N77-33361# California Univ., Berkeley. Dept. of Chemical Engineering.

VISCOELASTIC PROPERTIES OF HOMOGENEOUS BLOCK COPOLYMERS

M. Shen, D. Soong, and D. R. Hansen (Shell Develop. Co., Houston, Tex.) 15 May 1977 16 p refs

(Contract N00014-75-C-0955)

(AD-A042044; TR-13) Avail: NTIS HC A02/MF A01 CSCL 07/3

The molecular theory of Rouse-Bueche-Zimm has been modified to predict the viscoelastic behavior of homogeneous block copolymers. The model consists of beads and springs whose magnitudes correspond to the types of blocks in the polymer. Maximum relaxation times can be computed by this model. Viscoelastic data for poly(styrene-b-alpha-methylstyrene-b-styrene), poly alpha methylstyrene-b-styrene-b-alpha-methylstyrene poly (alpha-methylstyrene-b-styrene-b-alpha-methylstyrene) and poly(styrene-b-alpha-methylstyrene) were determined by stress relaxation methods. The results compare favorably with those predicted by the theory. Author (GRA)

N77-33362# California Univ., Berkeley. Dept. of Chemical Engineering.

RHEOPTICAL STUDIES OF BLENDS OF POLY (STYRENE-B-BUTADIENE-B-STYRENE) AND POLYSTYRENE

S. D. Hong, M. Shen, T. Russell (Mass. Univ., Amherst), and R. S. Stein (Mass. Univ., Amherst) 1 Jul. 1977 23 p refs

(Contract N00014-75-C-0955)

(AD-A042045; TR-14) Avail: NTIS HC A02/MF A01 CSCL 07/4

Polyblends of poly(styrene-b-butadiene) and polystyrene were cast from a tetrahydrofuran/methyl ethyl ketone mixture using a spin caster. These samples were found to undergo a 'strain-induced plastic-rubber transition' upon deformation. Infrared dichroism, birefringence, small angle X-ray scattering, small angle light scattering and scanning electron micrograph studies were carried out to investigate this phenomenon. Infrared dichroism and birefringence studies both indicate the high orientation of the polybutadiene chains, but not of the polystyrene chains, upon stretching. Thus most of the deformation after the 'transition' has taken place is due to the rubbery domains. Small angle X-ray scattering results reveal that the morphology in the three coordinate directions was different. Upon stretching, the polystyrene domains may have broken up into smaller sub-domains which could be responsible for the observed plastic-rubber transition. The small angle light scattering and scanning electron micrograph results appear to be consistent with the above proposed interpretations. Author (GRA)

N77-33363# Technion - Israel Inst. of Tech., Haifa. Material Mechanics Lab.

NONLINEAR ANELASTIC BEHAVIOR OF A SYNTHETIC RUBBER AT FINITE STRAINS

D. Derman, Z. Zaphir, and S. R. Bodner Mar. 1977 39 p refs

(Grant AF-AFOSR-2607-74)

(AD-A041777; MML-53; SR-11; AFOSR-77-0721TR) Avail: NTIS HC A03/MF A01 CSCL 11/10

A set of constitutive equations has been developed to represent nonlinear anelastic behavior, i.e. energy losses and rate dependent moduli for geometrically large, reversible deformations. These equations are in incremental form and can be used to solve boundary value problems by numerical methods. Two problems were considered: thick walled spheres subjected to cycles of internal pressure, and a long rod subjected to imposed axial velocity (the simple tension test). Experiments were carried out for both conditions on specimens made of a synthetic rubber at three different temperatures (each under isothermal conditions) and at different loading rates. Response curves were calculated based on the constitutive equations and chosen values of the material constants. Generally good agreement was obtained between the predicted and experimental results. Author (GRA)

N77-33364# Midwest Research Inst., Kansas City, Mo.

HIGH PRESSURE AND TEMPERATURE EFFECTS ON THE VISCOSITY, DENSITY AND BULK MODULUS OF TWO LIQUID LUBRICANTS Final Technical Report, Oct. 1975 - Mar. 1976

Vern Hopkins Dec. 1976 33 p refs

(Contract F33615-75-C-5116)

(AD-A041902) Avail: NTIS HC A03/MF A01 CSCL 11/8

Absolute viscosity, kinematic viscosity, density, and secant bulk modulus values determined for two lubricating fluids are presented. The determinations were made with a falling weight viscometer at temperatures of 38 C (100 F), 99 C (210 F) and 149 C (300 F) and at pressures ranging from atmospheric to 965 MPa (140,000 psi). Plots of absolute viscosity, density, and bulk modulus are given, and all results are discussed. The equipment used to make the determinations is described, and the procedures followed to collect data and reduce to fluid property values are outlined. The fluids were designated ATL 4102 and ELO 67-22. Author (GRA)

N77-33365# Catholic Univ. of America, Washington, D. C.
DYNAMICAL SHEAR AND STRUCTURAL VISCOELASTICITY IN ELASTOHYDRODYNAMIC LUBRICATION Technical Report, Feb. 1976 - Jun. 1977
C. J. Montrose, C. T. Moynihan, and H. Sasabe Jul. 1977 61 p refs
(Contract N00014-75-C-8056)
(AD-A041665; TR-6) Avail: NTIS HC A04/MF A01 CSCL 11/6

The thrust of this paper is to address the question of what dynamical properties of a viscoelastic liquid lubricant are instrumental in determining the traction in a heavily loaded rolling contact. In examining this question the dynamical changes that the large normal stresses in the contact zone produce in the lubricant film are explored. The effect of these structural changes on the response of the liquid to the imposed shear is then evaluated; from this, the shear stress profile in the contact-which determines the traction can be computed. Author (GRA)

N77-33366# RCA Labs., Princeton, N. J.
BASIC ADHESION MECHANISMS IN THICK AND THIN FILMS Quarterly Report, 1 Jan. - 31 Mar. 1977
Thomas T. Hitch and Kenneth R. Bube 30 Apr. 1977 29 p refs
(Contract N00019-77-C-0176)
(AD-A041959; PRRL-77-CR-18; QR-1) Avail: NTIS HC A03/MF A01 CSCL 11/1

The primary objective of this study is to construct models that will characterize the development of thick-film conductor adhesion, so that film properties may be predicted from the physical and chemical nature of the ink and substrate materials and from the processing to which these materials are subjected. The work of modeling the frit-bonded film adhesion strength has been divided into two parts: one is the development of the micro-structure; the other is the description of the adhesion strength in terms of the microstructure, the metal-phase/binder-phase interfacial adhesion, and other material properties. The study of reactively bonded and mixed-bonded inks seeks to model the formation of the binder-phase structure and to understand the behavior of that structure. This involves identification of the important structures, and the study of the kinetics of their formation. GRA

N77-33367# National Inst. for Occupational Safety and Health, Cincinnati, Ohio. Div. of Physical Sciences and Engineering.
ABRASION RESISTANCE OF SAFETY LENSES. EFFECTS OF ABRASION ON TOUGHENED SAFETY GLASS AND PLASTIC LENSES WITH RESPECT TO THEIR OPTICAL PROPERTIES
Donna M. Ascenzi Jun. 1976 40 p refs
(PB-267399/4; NIOSH-76/197; DHEW/PUB/NIOSH-76/197) Avail: NTIS HC A03/MF A01 CSCL 06Q

The abrasion resistance of safety spectacle and goggle lenses made from acetate, polycarbonate, toughened glass, vinyl and vinyl treated with an anti-fog coating is studied. In addition, the optical properties of prismatic power, refractive power and definition of some of the materials are examined. Goggle lenses are abraded on a Polaroid type B abrader. The toughened glass spectacle and goggle lenses are found to be superior to all other materials in all areas of testing. It is found that the polycarbonate spectacle lenses are coated, which increases their ability to resist abrasion. The need for judicious choices in the use of plastics in eye and face protective devices is stressed. GRA

N77-33368# Pennsylvania State Univ., University Park. Dept. of Chemistry.
SYNTHESIS OF ALKYL AND ARYL PHOSPHAZENE HIGH POLYMERS Interim Report
Harry R. Allcock, Dennis B. Patterson, and Thomas L. Evans 28 Jul. 1977 10 p refs
(Contract N00014-75-C-0685)
(AD-A042449; TR-77-1) Avail: NTIS HC A02/MF A01

The first stable, high molecular weight phosphazene polymers that contain alkyl- or arylgroups bonded directly to phosphorus have been synthesized by the interaction of organolithium or dialkylmagnesium reagents with poly-(difluorophosphazene). The polymers are elastomers or tough, flexible, film-forming materials. GRA

N77-33369# Uniroyal, Inc., Mishawaka, Ind. Engineered Systems Dept.
INVESTIGATION OF COATING COMPOUNDS AND ADHESIVES FOR SELF-SUPPORTING COLLAPSIBLE FUEL STORAGE TANKS Final Report, Apr. 1976 - May 1977
C. T. Chmiel, D. V. Perkins, and G. W. Bernier Jun. 1977 87 p refs
(Contract DAAG53-76-C-0140)
(AD-A042653; ES-77-2460-2) Avail: NTIS HC A05/MF A01 CSCL 11/3

Coatings and adhesives were evaluated as potential candidates from which self-supporting collapsible fuel storage tanks can be fabricated. The evaluation was concerned with polyurethane coatings, and was performed utilizing Glass, Kevlar, Dacron and Nylon fabrics as reinforcing members. Emphasis was placed on spray coating of one-shot polyurethane materials. GRA

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N77-33370# National Bureau of Standards, Washington, D. C. Inst. for Materials Research.
ESTIMATION OF NET ENTHALPIES OF COMBUSTION OF SOME AVIATION FUELS EXPRESSED IN THE INTERNATIONAL SYSTEM OF UNITS (SI) Final Report
Ralph L. Nuttall and George T. Armstrong Apr. 1977 64 p refs
(NBS-TN-937) Avail: SOD HC $1.30 as Ep46:937

Correlating equations, using SI units, which are linear in each of the variables; (1) aniline point in deg C: (2) reciprocal density in grams per cubic centimeter; and (3) sulfur mass percent, are presented for five classes of aviation fuels. These equations fit the observed values at least as well as the previous aniline point-gravity product equations. An equation which is quadratic in aniline point and reciprocal density was found to fit all the data with a standard deviation of 25.4 Btu/lb = 0.05904 MJ/kg. This equation can be used to predict the net heat of combustion of the fuels considered to within 50 Btu/lb or 0.11808 MJ/kg at a 95 percent confidence level. Author

N77-33371# Army Environmental Hygiene Agency, Aberdeen Proving Ground, Md.
PRELIMINARY ASSESSMENT OF RELATIVE TOXICITY OF ETHYL CENTRALITE (N, N PRIME-DIETHYLCARBANILIDE) Final Report, Apr. 1976 - Apr. 1977
Maurice H. Weeks and Arthur H. McCreesh 15 Jul. 1977 24 p
(AD-A041736; USAEHA-51-0923-77) Avail: NTIS HC A02/MF A01 CSCL 19/1

A hazard evaluation of ethyl centralite was performed using rats, rabbits and guinea pigs. Acetone solutions of the technical grade compound produced mild irritation when applied to the intact or abraded skin of rabbits, but the dry material did not. Direct application to rabbit eyes resulted in mild conjunctival irritation. Data indicated little toxic hazard from accidental ingestion or acute vapor inhalation. In vitro mutagenic studies were negative. It was recommended that personnel handling solid ethyl centralite wear approved eye and skin protective equipment. Author (GRA)

N77-33372# Acurex Corp., Mountain View, Calif. Aerotherm Div.
ALTERNATE PETROLEUM BASED FUELS FOR NAVAL FLEET USAGE: POTENTIAL AVAILABILITY, COST, AND SYSTEM IMPACT
L. M. Cohen, G. R. Offen, and L. M. Schalit Jun. 1977 147 p refs
(Contract N00014-76-C-0707)

(AD-A041980; Aerotherm-FR-77-247) Avail: NTIS HC A07/MF A01 CSCL 21/4

In recent years, particularly since the Oil Embargo of 1973, all major fuel consuming sectors in the United States Navy have become increasingly aware of the limited supply and high cost of petroleum fuels. Fuel is currently consumed by the Navy at the rate of 230,000 barrels per day. Energy conservation is one method to reduce this demand on petroleum resources and the resulting high annual expenditures for fuel. In addition, conservation is in the long-term interests of the country, since it assists nationwide efforts to 'stretch' our remaining oil reserves. Alternatives to petroleum-based fuels are another option. One of these, shale oil, is being evaluated by the Navy in their 100,000 barrel oil shale experiment. Yet another option could be the use of fuels which do not meet all the requirements of military specifications (MILSPECS) for fuels, but which could be burned without significantly impairing naval operations. This approach could increase fuel availability and reduce costs to the Navy. To assess the feasibility of using non-MILSPEC fuels in Navy combustion equipment, the David W. Taylor Naval Ship Research and Development Center engaged the Aerotherm Division of Acurex Corporation to perform a study with the following objectives: (1) determine whether there exists a large supply of fuel beyond that currently being procured for the Navy, which meets, or nearly meets, military specifications; (2) determine whether any such comparable 'nonspec' fuel is less expensive than the currently approved product, and (3) assess, using all available information, the viability of storing, handling, and burning comparable 'nonspec' fuels in naval systems, even if only on a limited basis. GRA

N77-33373# Ogden Air Logistics Center, Hill AFB, Utah. Propellant Lab. Section.

PROPELLANT SURVEILLANCE REPORT LGM-30 F AND G STAGE. PHASE E: SERIES 3, TP-H1011 Semiannual Report

John A. Thompson May 1977 135 p refs

(AD-A041671; MANCP-370(77)) Avail: NTIS MF A01 CSCL 21/9

This report contains propellant test results from cartons of TP-H1011 bulk propellant representing LGM-30 F and G First Stage Minuteman Motors. This report uses a statistical approach to analyze the bulk carton propellant data. Testing was accomplished in accordance with MMEMP Project M72632-5MP116P. The data from this test period are combined with data from previous testing and entered into the G085 computer for storage, analysis and regression analysis. From the statistical analysis of all data tested to date (twelve years for F and G), significant degradation of the propellant does not appear likely for at least two years past the oldest data point. Each point on the regression plot represents the mean of all samples at that particular age. The number of samples at each point is indicated on the sample size summary sheet on the page accompanying each regression plot or group of regression plots. The data range at any age can be found by suitable inquiry of the G085 system. Author (GRA)

N77-33374# Texaco, Inc., Montebello, Calif. Research Lab.

HYDROGEN PRODUCTION FROM COAL LIQUEFACTION RESIDUES Final Report

Allen M. Robin Dec. 1976 71 p

(EPRI Proj. 714-1)

(EPRI-AF-233) Avail: NTIS HC A05/MF A01

High ash H-coal residues from the liquefaction of coals were gasified in a synthesis gas generator. The synthesis gas produced consisted of over 92 percent volume carbon monoxide and hydrogen on a dry basis. Approximately 40 tons of each residue was gasified at 24 atmospheres pressure at residue feed rates up to 1/2 ton per hour. No major operating problems were experienced. Cold gas efficiencies averaged between 83 and 84 percent. Steam and oxygen requirements were comparable to those of heavy oil gasification. Enough data were obtained to verify existing computer correlations and establish information needed to provide a commercial plant design for these two, and other similar, coal liquefaction residues. ERA

N77-33375# Energy Research and Development Administration, Bartlesville, Okla. Bartlesville Energy Research Center.

PHYSICAL PROPERTIES OF GASOLINE/METHANOL MIXTURES

B. H. Eccleston and F. W. Cox Jan. 1977 84 p refs

(BERC/RI-76/12) Avail: NTIS HC A05/MF A01

Experimental work was done to relate selected physical properties of gasoline/methanol solutions, containing contaminant levels of water, to compositional and physical properties of the blending gasoline. Water tolerance, octane number, vapor pressure, and distillation data are presented for eight gasolines and for their methanol solutions at methanol levels up to 20 wt-pct. The water tolerances of these fuels were strongly dependent upon temperature, methanol concentration, and gasoline composition. It is shown that an estimate can be made of the water tolerance of a gasoline/methanol mixture when the composition of the gasoline is known in sufficient detail. Portions of the D-86 distillation curves of gasoline/methanol mixtures can be estimated from a knowledge of the base gasoline distillation curves. In the region of 5 to 20 pct methanol content, vapor pressures can be estimated from those of the gasolines. The blending octane numbers resulting from the study agree well with previously published values. ERA

N77-33376# Utah Univ., Salt Lake City. Dept. of Mechanical Engineering.

COMPUTER PROGRAM FOR DETERMINING THE THERMODYNAMIC PROPERTIES OF LIGHT HYDROCARBONS

David H. Riemer, Harold R. Jacobs, Robert F. Boehm, and Donald S. Cook 1976 88 p refs

(Contract EY-76-S-07-1523; Grant NSF AER-75-01039)

(UTEC-ME-76-211) Avail: NTIS HC A05/MF A01

This program was written to be used as a subroutine for analysis of the following light hydrocarbons: butane, ethylene, heptane, hexane, isobutane, isopentane, methane, octane, pentane, propane and propylene. The subroutine, given any of the following pairs of state quantities: pressure and quality, pressure and enthalpy, pressure and entropy, temperature and pressure, temperature and quality and temperature and specific volume, allows the user to analyze any thermodynamic cycle utilizing a light hydrocarbon as the working fluid. The Starling-Benedict-Webb-Rubin equation of state was used. A brief description, flowchart, listing and required equations for each subroutine are included. ERA

N77-33377# Bonner and Moore Associates, Inc., Houston, Tex.

OVERVIEW AND REVIEW OF MOTOR GASOLINE DESULFURIZATION, VOLUME 1

Dec. 1976 80 p refs

(Contract EY-76-C-02-0041)

(BERC/RI-76/17-Vol-1) Avail: NTIS HC A05/MF A01

The general technology for desulfurizing motor gasoline is described and prior studies reviewed. The removal of additional sulfur from motor gasoline may be required because catalytic converters on 1975 and later model cars may convert the sulfur into potentially environmentally undesirable compounds, sulfuric acid mist and sulfate particles, when the exhaust passes through the catalytic converter. While other methods of solving this environmental issue are available, only the removal of additional sulfur from gasoline is considered. ERA

N77-33378# Bonner and Moore Associates, Inc., Houston, Tex.

MOTOR GASOLINE DESULFURIZATION STUDY, VOLUME 2

Dec. 1976 164 p

(Contract EY-76-C-02-0041)

(BERC/RI-76/17-Vol-2) Avail: NTIS HC A08/MF A01

For abstract, see N77-33377.

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N77-33379*# Harmon Engineering, Huntsville, Ala.

EVALUATION OF ANALYTICAL METHODOLOGY FOR HYDROCARBONS IN HIGH PRESSURE AIR AND NITROGEN SYSTEMS

29 Jul. 1977 62 p
(Contract NAS8-32200)
(NASA-CR-150409; Rept-35276-02) Avail: NTIS HC A04/MF A01 CSCL 20L

Samples of liquid oxygen, high pressure nitrogen, low pressure nitrogen, and missile grade air were studied to determine the hydrocarbon concentrations. Concentration of the samples was achieved by adsorption on a molecular sieve and activated charcoal. The trapped hydrocarbons were then desorbed and transferred to an analytical column in a gas chromatograph. The sensitivity of the method depends on the volume of gas passed through the adsorbent tubes. The value of the method was verified through recoverability and reproducibility studies. The use of this method enables LOX, GN2, and missile grade air systems to be routinely monitored to determine low level increases in specific hydrocarbon concentration that could lead to potentially hazardous conditions. Author

N77-33380*# Harmon Engineering, Huntsville, Ala.
EVALUATION OF ANALYTICAL METHODOLOGY FOR HYDROCARBONS IN HIGH PRESSURE AIR AND NITROGEN SYSTEMS
4 Mar. 1977 64 p refs
(Contract NAS8-32200)
(NASA-CR-150410; H352-02) Avail: NTIS HC A04/MF A01 CSCL 20L

Information regarding the safety limits of hydrocarbons in liquid and gaseous oxygen, the steps taken for hydrocarbon removal from liquified gases, and the analysis of the contaminants was searched and the results are presented. The safety of hydrocarbons in gaseous systems was studied, and the latest hydrocarbon test equipment and methodology is reviewed. A detailed sampling and analysis plan is proposed to evaluate high pressure GN2 and LOX systems. Author

N77-33381# Stanford Research Inst., Menlo Park, Calif. Transportation Center.
EVALUATION METHODOLOGY FOR FEDERAL MOTOR VEHICLE SAFETY STANDARDS. VOLUME 1: EXECUTIVE SUMMARY
R. L. Braun, R. H. Cronin, N. A. David, A. V. Fend, and J. R. Norman May 1977 29 p
(Contract DOT-HS-6-01519)
(PB-266936/4; DOT-802340-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 13F

The results of a six month study to determine feasibility and appropriate evaluation schemes in a real world environment for four Federal motor vehicle safety standards are summarized: (1) fuel integrity; (2) occupant protection; (3) side door strength; and (4) exterior protection. Based on a review of the literature, background material, specifications, compliance tests, and available evaluation methodologies, feasibility was established for the evaluation of three safety standards. Within an augmented National crash severity study program, detailed evaluation plans for motor vehicle safety standards are described and recommended. GRA

N77-33382# Stanford Research Inst., Menlo Park, Calif.
EVALUATION METHODOLOGY FOR FEDERAL MOTOR VEHICLE SAFETY STANDARDS. VOLUME 2: TECHNICAL FINDINGS Final Report, 1 Sep. 1976 - 31 Mar. 1977
R. L. Braun, R. H. Cronin, N. A. David, A. V. Fend, and J. R. Norman May 1977 212 p refs
(Contract DOT-HS-6-01519)
(PB-266937/2; DOT-HS-802341-Vol-2) Avail: NTIS HC A10/MF A01 CSCL 13F

Overall study details are described and a thorough discussion of the evaluation plan developed for four federal motor vehicle safety standards is presented. After a statement of the problem and a descrption of each standard, applicable technical factors are discussed, alternative evaluation methodologies are reviewed and assessed, the recommended evaluation study design is presented, and finally a plan for implementing the evaluation is provided. GRA

N77-33383# Naval Weapons Station, Yorktown, Va.
A SAFETY, QUALITY AND COST EFFECTIVENESS STUDY OF COMPOSITION A3 PRESS LOADING PARAMETERS,2 Final Report
E. Yancey McGann and Lewis R. Rothstein Mar. 1977 45 p refs
(AD-A041078; NWSY-TR-77-1) Avail: NTIS HC A03/MF A01 CSCL 19/1

This report presents further details of a safety, quality and cost effectiveness study of loading gun ammunition with Composition A-3 explosive previously reported in NWSY TR 76-1. Processing parameters were required to increase gun firing safety and increase explosive load quality using material with a bulk density of less than 0.81 g/cc at the lowest possible cost. The temperature and pressing efforts were investigated and production processing parameters were established. The problem of explosive cracking after temperature cycling was traced to the new type waxes being used in the manufacture of the Composition A-3. The ram configuration, pressing pressure, increment weights and sizes were optimized for limited range of temperatures. Author (GRA)

N77-33384# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
SAFETY INFORMATION SYSTEM GUIDE
M. G. Bullock Mar. 1977 72 p refs
(Contract EY-76-C-07-1570)
(ERDA-76-45/9; SSDC-9) Avail: NTIS HC A04/MF A01

Guidelines for the design and evaluation of a working safety information system are presented. General design and evaluation requirements were established. Implementation and design of the data collection system are described with emphasis on the data base, and quick response systems. Hazard identification information was established. B.B.

N77-33385# Northwestern Univ., Evanston, Ill.
WIND LOAD REQUIREMENTS FOR BUILDINGS
Richard A. Parmelee, ed. Jun. 1976 269 p Proc. of a workshop held at Evanston, Ill., 3-4 Jun. 1976; sponsored in part by NBS, Washington, D.C. and Wind Engineering Research Council
(Grant NSF ENG-76-02302)
(PB-268547/7; NSF/RA-760754) Avail: NTIS HC A12/MF A01 CSCL 13M

The current state-of-the-art of wind loading on building structures, including the results from recent research investigations are summarized. Deficiencies in current code guidelines were identified and they provided a basis for discussions. Papers were presented by participants as well as transcripts of tape recordings made during the workshop which are included. Some topics are: (1) trends toward national wind load provisions; (2) treatment of wind loads in the national building code of Canada; (3) extreme wind analysis methods and data availability; (4) wind microzonation; (5) model building codes; and (6) wind loads on cladding/codes and research. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N77-33386# Dikewood Industries, Inc., Albuquerque, N. Mex.
INTERACTION OF A RECTANGULAR FERRITE SLAB WITH MAGNETIC FIELDS Final Report
John Lam Kirtland AFB, N. Mex. AFWL May 1977 44 p refs
(Contract F29601-75-C-0120)
(AD-A041944; DC-TN-1225-1; AFWL-TR-76-195) Avail: NTIS HC A03/MF A01 CSCL 20/3

The general problem of permeable body in external magnetic fields is formulated as a two-dimensional Fredholm integral equation of the second kind. Using the method of averaging functional corrections, the equation is solved approximately for a highly-permeable rectangular solid (a) in a uniform field and (b) in the field of a rectangular current loop wound around the midsection of the solid. A large magnetic flux concentration is found in both cases for a thin solid. The results are applicable

to the analysis of an aircraft VLF magnetic loop receiving antenna. Author (GRA)

N77-33387*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.

ELECTROMAGNETIC PLASMA WAVE EMISSIONS FROM THE AURORAL FIELD LINES

Donald A. Gurnett Sep. 1977 39 p refs Presented at 3d Gen. Sci. Assembly of the Intern. Assoc. of Geomagnetism and Aeronomy, Seattle, 1977 Submitted for publication
(Contracts NAS1-11257; NAS1-13129; NAS5-11431; Grants NGL-16-001-002; NGL-16-001-043)
(NASA-CR-155172; U-of-Iowa-77-36) Avail: NTIS HC A03/MF A01 CSCL 20N

The most important types of auroral radio emissions are reviewed, both from a historical perspective as well as considering the latest results. Particular emphasis is placed on four types of electromagnetic emissions which are directly associated with the plasma on the auroral field lines. These emissions are (1) auroral hiss, (2) saucers, (3) ELF noise bands, and (4) auroral kilometric radiation. Ray tracing and radio direction finding measurements indicate that both the auroral hiss and auroral kilometric radiation are generated along the auroral field lines relatively close to the earth, at radial distances from about 2.5 to 5 R sub e. For the auroral hiss the favored mechanism appears to be amplified Cerenkov radiation. For the auroral kilometric radiation several mechanisms have been proposed, usually involving the intermediate generation of electrostatic waves by the precipitating electrons. Author

N77-33388*# City Coll. of the City Univ. of New York. Communications Systems Lab.

COMMUNICATION SYSTEM ANALYSIS FOR MANNED SPACE FLIGHT Technical Report, 17 Apr. 1976 - 1 Jun. 1977

Donald L. Schilling 1 Jun. 1977 52 p refs
(Contract NAS9-13940)
(NASA-CR-151508) Avail: NTIS HC A04/MF A01 CSCL 17B

One- and two-dimensional adaptive delta modulator (ADM) algorithms are discussed and compared. Results are shown for bit rates of two bits/pixel, one bit/pixel and 0.5 bits/pixel. Pictures showing the difference between the encoded-decoded pictures and the original pictures are presented. The effect of channel errors on the reconstructed picture is illustrated. A two-dimensional ADM using interframe encoding is also presented. This system operates at the rate of two bits/pixel and produces excellent quality pictures when there is little motion. The effect of large amounts of motion on the reconstructed picture is described. Author

N77-33389*# Rice Univ., Houston, Tex.

IONOSPHERE/MICROWAVE BEAM INTERACTION STUDY Final Report

Lewis M. Duncan and Wm. E. Gordon Sep. 1977 123 p refs
(Contract NAS9-15212)
(NASA-CR-151517) Avail: NTIS HC A06/MF A01 CSCL 20N

A solar power satellite microwave power density of 20mw sq cm was confirmed as the level where nonlinear interactions may occur in the ionosphere, particularly at 100 km altitude. Radio wave heating at this altitude, produced at the Arecibo Observatory, yielded negative results for radio wave heating of an underdense ionosphere. Overdense heating produced striations in the ionosphere which may cause severe radio frequency interference problems under certain conditions. The effects of thermal self-focusing are shown to be limited severely geographically. The aspect sensitivity of field-aligned striations makes interference-free regions above magnetic latitude about 60 deg. A test program is proposed to simulate the interaction of the SPS beam with the ionosphere, to measure the effects of the interaction on the ionosphere and on communication and navigation systems, and to interpret the results. Author

N77-33390# Syracuse Univ., N. Y. Dept. of Electrical Engineering.

COUPLING THROUGH ROTATIONALLY SYMMETRIC APERTURES IN CAVITIES OF REVOLUTION

H. K. Schuman and D. E. Warren Jun. 1977 47 p refs
(Contract F30602-75-C-0121)
(AD-A042093; RADC-TR-77-214) Avail: NTIS HC A03/MF A01 CSCL 20/3

A method for predicting the field penetrating a circumferential opening in a cavity of revolution is described here. This method employs the method of moments and an aperture equivalence theorem. The former permits rotationally symmetric cavities with otherwise arbitrary contours. The latter improves the sensitivity of field computation when the aperture height is tiny and/or points deep within the cavity are sought. This method is evaluated with comparison to classical theory and experiment via application to spherical and cylindrical cavities. Results for a missile-like cavity irradiated by an obliquely incident plane wave are given. A computer program and user manual is available. Author (GRA)

N77-33391# Perceptronics, Inc., Woodland Hills, Calif.

COMPUTER-BASED SUPERVISORY SYSTEM FOR MANAGING INFORMATION FLOW IN C3 SYSTEMS: PACING MODEL Progress Report, 1 Oct. 1976 - 30 Mar. 1977

Michael G. Samet and Kent B. Davis Mar. 1977 50 p refs
(Contract MDA903-76-C-0241; ARPA Order 3200)
(AD-A040359; PTR-1033-77-3) Avail: NTIS HC A03/MF A01 CSCL 17/2

This report describes progress on work centered on the demonstration of a system of integrated on-line adaptive user models designed to automatically select and pace information in a simulated command, control, and communication (C3) system. The report includes: (1) a human-factors based rationale for improving information flow in C3 systems; (2) a description of modifications made to the Tactical and Negotiations Game (TNG) scenario to create a C3 decision simulation in which automatic selection and pacing of information can be realistically accomplished; (3) the conceptual specification of a real-time, computer-based model for automatically adapting message pacing rate to the information processing and decision making capabilities of an individual operator; (4) an overview of the software configuration being implemented to support the system. The next phase of work will focus on the system implementation of the newly developed configuration of information selection and pacing models. Author (GRA)

N77-33392# Naval Research Lab., Washington, D. C.

EXPERIMENTAL INVESTIGATION OF THE CHARACTERISTICS OF Pc1 MICROPULSATION PROPAGATION USING A MIDLATITUDE FIVE-STATION RECEIVING NETWORK Final Report

Edwin L. Althouse and John R. Davis 18 May 1977 98 p refs
(AD-A040265; NRL-8086) Avail: NTIS HC A05/MF A01 CSCL 17/2

An experimental study has been made of the characteristics of the propagation of midlatitude Pc1 micropulsations for the purpose of assessing the applicability of the 0.5-2.0 Hz frequency band to naval communications. Naturally occurring hydromagnetic emissions were the object of study because no effective way of artificially generating these waves is known. Observations were made using a five-station receiving network stretching from New York to Florida and from Maryland to Illinois. All data were telemetered in real time over telephone data lines to NRL for centralized recording and analysis. Amplitude, spectral, and polarization characteristics are presented for the data analyzed. Cross-correlation was used to determine propagation time delays between sites. The time delays were used as input parameters for three methods of propagation analysis to determine the speed and direction of arrival of the Pc1 waves. The first analysis method considers the propagation to be that of a plane wave traveling over a flat earth; the second method considers the propagation to be that of a plane wave traveling over a spherical earth. The third method (called the source location method) assumes that the wave front spreads radially over a spherical earth from a localized source. Of the three analysis methods, the source location method satisfied the data best, had smaller standard deviations for the values of propagation velocity determined, and was more consistent in computed direction of arrival. No case of east-to-west propagation was observed, but

this is primarily due to the mid-latitude location of the observation sites. GRA

N77-33393# Defense Communications Engineering Office, Reston, Va.
SYSTEM INTEGRATION AND INTERFACE TRANSITION ISSUES
Mar. 1977 195 p refs
(AD-A041457; TR-2-77) Avail: NTIS HC A09/MF A01 CSCL 17/2

This Technical Report documents systems engineering and analysis in support of the DCS Plan FY 80/90. Transition issues regarding system integration and interfaces among subsystems are treated. Six system-level issues perceived as the most critical are defined and analyzed. The most critical and the most promising areas for continuing studies are recommended. Author (GRA)

N77-33394# Rome Air Development Center, Griffiss AFB, N.Y.
THE PRESENT TECHNOLOGY OF IMPULSE RADARS
Paul Vanetten Jun. 1977 28 p refs
(AD-A042094; RADC-TR-77-197) Avail: NTIS HC A03/MF A01 CSCL 17/9

From the birth of radar there has been a steady trend to increase the radiated bandwidth to obtain high resolution, extreme accuracy, target identification, and fine imagery. The ultimate radiated waveform to achieve these goals is an impulse. The present capability of generating multimegawatt subnanosecond impulsive waveforms is discussed including future limitations on the maximum peak power. A theoretical discussion of radiation and reception of impulse waveforms, as well as the experimental responses of selected antennas, is given. The paper presents an antenna dilemma resulting from operation with instantaneous bandwidths greater than a decade. Because of the antenna's inherent limitations, other transient waveform responses are also discussed including a ramp (double integrated impulse) and a monocycle (differentiated impulse) radar. MTI (Moving Target Indicator) operation is discussed showing that target blind velocities do not occur as with conventioal MTI radars. A solution to the very practical problem of obtaining a large energy content in an impulsive radiation is achieved by temporal-spatial compression. Here, a dispersive antenna is employed as a pulse compression network resulting in enhanced electromagnetic field intensity. Finally, some short-range impulse radar backscatter is shown for several targets. Author (GRA)

N77-33395# Stanford Univ., Calif. Electronics Labs.
AIR/UNDERSEA COMMUNICATION AT ULTRA-LOW-FREQUENCIES USING AIRBORNE LOOP ANTENNAS Technical Report, Jan. 1975 - Feb. 1977
A. C. Fraser-Smith, D. M. Bubenik, and O. G. Villard, Jr. Jun. 1977 81 p refs
(Contract N00014-75-C-1095; ARPA Order 1733)
(AD-A042132; SU-SEL-77-013; SU-TR-4207-6) Avail: NTIS HC A05/MF A01 CSCL 17/2

In this report we investigate the possibility of using ultra-low-frequency (ULF) signals from airborne loop antennas (i.e., magnetic dipoles) for air/undersea communication. Because of the low data rate at ULF, communication is here understood to mean the transfer of short messages of high information content. We use numerical integration to calculate the 1 Hz total magnetic field amplitudes in the sea at depths from 0 m to 200 m due to airborne unit moment vertical and horizontal magnetic dipoles at altitudes from 100 m to 10 km. Considering the magnetic moments m attainable with present aircraft power and payload capability (m = 10 to the 7th A sqm - 10 to the 9th A sq m and the minimum detectable amplitude for a 1 Hz signal beneath the sea (approx. 1 m sub gamma, we conclude that air/undersea communication at 1 Hz is possible under the following illustrative conditions: for a horizontal plane loop antenna at 3000 m altitude and a ULF receiver at a 100 m depth, communication is possible for horizontal distances to 10 km for m = 10 to the 7th a sq m and to 33 km for m = 10 to the 9th A sq m. The corresponding limits for a vertical plane loop antenna are 13 km to 64 km. It is also possible, if desired, to limit communication to a comparatively small circular area directly beneath the aircraft. Sea floor effects can alter these values significantly, particularly if the receiver is near the floor. Author (GRA)

N77-33396# Stanford Research Inst., Menlo Park, Calif.
REDUCED STATE VITERBI DETECTOR DEMONSTRATION Final Report, Feb. 1976 - Apr. 1977
S. P. Russell, S. E. Cannon, and A. Shohara Apr. 1977 79 p
(Contract DCA100-76-C-0037)
(AD-A041712) Avail: NTIS HC A05/MF A01 CSCL 17/2

Early work on a new detection method applicable to band-limited satellite channels was extended. The method, termed reduced-state Viterbi detection, is a derivative of the Viterbi algorithm. In the study reported here, the potential of combining Viterbi detection of band-limited sequences with Viterbi decoding of error-correction codes was examined through simulation. A breadboard reduced-state detector was designed, and results were obtained from actual test. These results verified the predictions of the earlier study and showed that reduced state detection can lead to significant increases in band-limited satellite channel performance. Author (GRA)

N77-33397# Stanford Research Inst., Menlo Park, Calif.
ANALYSIS OF RADAR DETECTION OF AGITATED METALS (RADAM) Final Report, 1 Apr. 1976 - 31 Mar. 1977
A. J. Bahr, J. P. Petro, and L. E. Sweeney, Jr. May 1977 45 p refs
(Contract F44620-75-C-0046; AF Proj. 2305)
(AD-A041713; AFOSR-77-0777TR; IR-2) Avail: NTIS HC A03/MF A01 CSCL 17/9

It has been observed that the radar returns from moving multielement metal targets often exhibit an unexpected modulation that has both random (or noise-like) and semicoherent components. One possible mechanism for producing this effect is the modification of the current distribution on the target that results when electrical contacts between target elements are altered intermittently by the forces associated with target motion. Such intermittent-contact modulation must be considered in the design of a radar for detecting or identifying a target exhibiting this effect. Depending on the application, the observer may wish to enhance or suppress the observation of the effect, or it may be important that the effect itself be enhanced or suppressed in the object being observed. To accomplish any of these, the effect must be well understood, and we have therefore undertaken a program of research to study the radar detection of agitated metals (RADAM). This report summarizes our progress during the second year of the program. The overall objectives of our RADAM research program are to (1) identify and isolate the physical processes and mechanisms that contribute to a RADAM signature, (2) identify and explain important recognizable features of the signature, and (3) determine means for separating the significant identifying components of the signature from nonmeaningful components. GRA

N77-33398# Army Construction Engineering Research Lab., Champaign, Ill.
STATE OF THE ART IN FIBER OPTICS COMMUNICATIONS AND DATA TRANSFER Interim Report
R. G. McCormack, W. J. Croisant, and P. C. Lam Jul. 1977 43 p refs
(AD-A042579; CERL-IR-E-11) Avail: NTIS HC A03/MF A01 CSCL 20/6

This report addresses the state of the art of fiber optic communications as related to U.S. Army Corps of Engineers military construction. It discusses the general capabilities of commercially available fiber optics and summarizes the research and development work being done in the area by other Department of Defense and U.S. Government agencies. Potential Corps of Engineers usage of fiber optics is discussed, and nuclear radiation hardening aspects are summarized. Interfacing optical fibers with electronics is discussed along with factors which limit the performance of fiber optics data transmission links.
Author (GRA)

N77-33399# National Academy of Sciences - National Research Council, Washington, D. C. Committee on Biosphere Effects of Extremely-Low-Frequency Radiation.
BIOLOGIC EFFECTS OF ELECTRIC AND MAGNETIC FIELDS ASSOCIATED WITH PROPOSED PROJECT SEAFARER
1977 445 p refs
(Contract N00014-75-C-0258)
(AD-A042515) Avail: NTIS HC A19/MF A01 CSCL 06/18

This report has been prepared by the Committee on Biosphere Effects on Extremely-Low-Frequency Radiation in response to a request from the United States Navy for a study of the possibility that plants, people, and other animals would be harmed by the electric and magnetic fields associated with operation of the transmitter of the Seafarer communication system proposed by the Navy. Author (GRA)

N77-33400# California Univ., Berkeley. Lawrence Berkeley Lab.

ANALYSIS OF WIRE ANTENNAS IN THE PRESENCE OF A CONDUCTING HALF SPACE. PART 3: THE BURIED ANTENNA

E. K. Miller and F. J. Deadrick 25 Feb. 1977 39 p refs (Contract W-7405-eng-36)
(UCRL-52228) Avail: NTIS HC A03/MF A01

The reflection coefficient approximation (RCA) for modeling objects located near an interface between electrically different half spaces is discussed. The procedure to handle objects on opposite sides of the interface is described. The method, which is denoted as the transmission coefficient approximation (TCA), is based on a ray-optics formulation and an assumed reciprocity along a given ray path. An integral-equation, moment-method technique for wires, when combined with the RCA-TCA, permits modeling the response of antennas above ground to buried objects. Similar problems of geophysical interest as well as those of the more conventional antenna interface, may also be modeled. Sample results to illustrate how the technique may be applied are presented. A comparison of results is made between the RCA-TCA and those obtained from a rigorous treatment based on the Sommerfeld integrals to demonstrate the validity of the approximate approach. ERA

N77-33401# European Space Agency, Paris (France).

THE THEORY OF DIFFRACTION BY A PERFECTLY CONDUCTING WEDGE OF ARBITRARY ANGLE APPLIED TO ANTENNA PATTERNS

Nikolaos Stavropoulos Sep. 1977 69 p refs Transl. into ENGLISH of 'Die Theorie der Beugung am idealleitenden Winkel beliebiger Oeffnung zur Anwend. auf Antennendiagramme', DFVLR, Brunswick Report DLR-FB-77-05, 22 Feb. 1977 Original report in GERMAN previously announced as N77-30341 Original German report available from DFVLR, Cologne DM 33.20
(ESA-TT-416; DLR-FB-77-05) Avail: NTIS HC A04/MF A01

The complex integral equation derived from the theory of fraction of light at a wedge limited by two perfectly conducting half planes is dealt with. This theory has been applied to an electromagnetic wave and further developed and improved. The general complex integral equation of diffraction is stated, plotted numerically, and examined for the exterior as well as for the interior wedge. In the case of a spherical incoming wave a number of far field diagrams of diffraction were plotted. The electrical field intensity was polarized vertically or horizontally to the edge. The fields were calculated for a vertical incidence of the spherical wave to the edge, for a distance from radiation point of 3 lambda, and for several incidence angles to one half plane. The radiation fields of a mono- and dipole, respectively, were calculated using the diffraction field in the presence of a conducting plate with finite dimensions, of a rectangular conducting parallelepiped and of a 120 and 270 deg, respectively, corner reflector. The theoretical results are partly compared with experimentally obtained patterns. Author (ESA)

N77-33402# Office of Telecommunications, Boulder, Colo. Inst. for Telecommunication Sciences.

EARTH-SPACE ATTENUATION PREDICTION PROCEDURES AT 4 TO 16 GHz

E. J. Dutton May 1977 91 p refs
(PB-269228/3; OTR-77-123) Avail: NTIS HC A05/MF A01 CSCL 20N

Theoretical and experimental procedures for obtaining rain rate distributions over a period of time (usually an average year) are examined. Some procedures for modeling earth-space rain-caused, and clear-air attenuation are discussed, after which some comparisons of data and the modeling procedures are made. A sample earth-space attenuation climatology in the conterminous United States is developed. Two small climatological 'subzones', each consisting of four cities, are developed as exemplary of the kind of attenuation variations that an earth-satellite communications link can expect to encounter. Graphical and tabular results are given to indicate the climatological variability of a number of presumed earth-space paths. GRA

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N77-33403# Hokkaido Univ., Sapporo (Japan). Research Inst. of Applied Electricity.

EQUIVALENT CIRCUIT REPRESENTATION OF COUPLED MULTIWIRE LINE AND ITS APPLICATION

Nobuo Nagai, ed. and Kozo Hatori, ed. 1977 110 p refs
(Mono-24-1977; ISSN-0439-3465) Avail: NTIS HC A06/MF A01

Modal decomposition, propagation modes, and equivalent circuit representations are described for coupled multiwire lines. Analysis and synthesis of hybrid power dividers is then accomplished by applying such equivalent circuit representations. Constant-resistance power dividers which use directional couplers are then described. For individual titles, see N77-33404 through N77-33408.

N77-33404# Hokkaido Univ., Sapporo (Japan).

MODAL DECOMPOSITION AND EQUIVALENT CIRCUIT REPRESENTATIONS OF LOSSLESS COUPLED MULTIWIRE LINES

Nobuo Nagai *In its* Equivalent Circuit Representation of Coupled Multiwire Line and Its Appl. 1977 p 7-32 (For primary document see N77-33403 24-33)
Avail: NTIS HC A06/MF A01

Equivalent circuit representations and propagation modes on lossless coupled n-wire transmission-lines are assumed to satisfy Telegrapher's equations presented by the matrix partial differential equations. It is shown that the equivalent circuit for the n-wire line can be represented to be a cascade connection of Ideal transformer Interconnections (ITI), a set of n transmission lines (in the mode space) and ITI. The transformation matrix for the ITI can be classified into three types: (A) an orthogonal matrix, (B) a product of diagonal and orthogonal matrices, and (C) a product of orthogonal, diagonal and orthogonal matrices. Three kinds of characteristic impedances are described: n characteristic impedances for n lines in the mode space, the characteristic impedance matrix and nxn characteristic wire impedances. It is also shown that the bi-orthogonality of propagation is satisfied among voltage propagation modes and current propagation modes. An even mode and an odd mode supported on a symmetrical two-wire line are extended into propagation modes on n-wire lines, and a voltage even mode and current odd modes are obtained. Author

N77-33405# Hokkaido Univ., Sapporo (Japan).

MODAL DECOMPOSITION AND EQUIVALENT CIRCUIT REPRESENTATIONS OF LOSSY COUPLED MULTIWIRE LINES

Nobuo Nagai *In its* Equivalent Circuit Representation of Coupled Multiwire Line and Its Appl. 1977 p 33-60 refs (For primary document see N77-33403 24-33)
Avail: NTIS HC A06/MF A01

Multiwire transmission lines are in general assumed to satisfy Telegrapher's equations which are presented by the matrix partial differential equations. The general technique for solving transmission-line equation is to diagonalize the product of the per-unit-length impedance and admittance matrices by using similarity transformations (modal decomposition). The diagonalized elements are related to propagation constants of the travelling waves on the line and the similarity transformation matrix (modal-decomposition matrix) is related to propagation modes which consist of voltage and current propagation modes. The

following modal decomposition procedures of lossy coupled n-wire lines are discussed: (1) the Jordan form of the product of the per-unit-length impedance and admittance matrices is shown to become a diagonal matrix, (2) it is also shown that two of the transposition of the voltage modal-decomposition matrix and the current modal-decomposition matrix becomes a diagonal matrix (bi-orthogonality of propagation modes), and (3) the equivalent circuit representation is of lossy coupled n-wire line according to transformer interconnections and is demonstrated. Author

N77-33406# Hokkaido Univ., Sapporo (Japan).
A NEW ANALYSIS OF n-WAY HYBRID POWER DIVIDERS WITH EQUIAMPLITUDES
Nobuo Nagai and Eiji Maekawa *In its* Equivalent Circuit Representation of Coupled Multiwire Line and Its Appl. 1977 p 61-82 refs (For primary document see N77-33403 24-33)
Avail: NTIS HC A06/MF A01

One of the distributed-constant circuits that divides one microwave input into n outputs is the n-way Hybrid Power Divider (HPD). An analysis of n-way HPD is obtained by cascading M sections of coupled n-wire lines of equal length with isolation resistors which are given by a general n-port resistive circuit including the Y-connection. The analysis is done by getting the eigenvalues and the corresponding eigenvectors of characteristic admittance matrices of n-wire coupled lines and admittance matrices for isolation resistors. By this analysis, it has been shown that the (n+1)-port made with a coupled n-wire line with isolation resistors of the Y-connection acts as an n-way HPD at narrow-band frequencies. Author

N77-33407# Hokkaido Univ., Sapporo (Japan).
A NEW ANALYSIS OF n-WAY HYBRID POWER DIVIDERS WITH ARBITRARY POWER SPLITTING RATIOS
Nobuo Nagai, Eiji Maekawa, and Koutaro Mizuno *In its* Equivalent Circuit Representation of Coupled Multiwire Line and Its Appl. 1977 p 83-103 refs (For primary document see N77-33403 24-33)
Avail: NTIS HC A06/MF A01

An analysis is carried out of n-way Hybrid Power Dividers (HPD) which split an input signal into n output signals in phase and with arbitrary amplitude ratios, and which is obtained by cascading M sections of coupled n-wire lines of equal length with isolation resistors that are given by a general n-port resistive circuit including the Y-connection. It has been described that n output port conductances, characteristic admittance matrices and isolation resistors are directly obtained from the power dividing ratios. The analysis is done by getting the eigenvalues and the corresponding eigenvectors of characteristic admittance matrices of n-wire coupled lines and admittance matrices for isolation resistors multiplied by the diagonal matrix constituted with the power dividing ratios. By this analysis, it has been shown that the (n+1)-port made with a coupled n-wire line with isolation resistors of the Y-connection acts as an n-way HPD at narrow-band frequencies. The broad-band n-way HPD may be obtained easily by numerical computation, because the scattering matrix of an n-way HPD has been obtained. Author

N77-33408# Hokkaido Univ., Sapporo (Japan).
A CONSTANT-RESISTANCE POWER DIVIDER USING SINGLE-ELEMENT COUPLERS AND ITS OPTIMUM DESIGN FOR WIDE BANDWIDTH
Iwata Sakagami, Kozo Hatori, and Nobuo Nagai *In its* Equivalent Circuit Representation of Coupled Multiwire Line and Its Appl. 1977 p 105-114 refs (For primary document see N77-33403 24-33)
Avail: NTIS HC A06/MF A01

A microwave-region power divider using single-element couplers is described and a new property of single-element coupler clarified. An argument of this paper is limited to single-element couplers, but similar reasoning is applicable to multi-element asymmetric couplers. Main points of this paper are summarized as follows: (1) If two characteristic terms of bandwidth ratio BW and ripple R are introduced to the design of a single-element coupler, the insertion loss function of the main-line can be represented by a first-order Chebyshev polynomial. (2) There exists a peculiar relation between the mean coupling and the roots of the Chebyshev polynomial. (3) Optimization of power division characteristics of a constant-resistance n-output-port power divider is considered. Author

N77-33409*# California Inst. of Tech., Pasadena.
MILLIMETER-WAVE ANTENNA DESIGN Final Report
Robert B. Leighton May 1977 55 p
(Contract NAS5-23696)
(NASA-CR-152608) Avail: NTIS HC A04/MF A01 CSCL 09C

Problems and opportunities are discussed for adapting certain design features and construction techniques, developed for producing high accuracy ground based radio dishes, to producing milimeter wave dishes for space use. Specifically considered is a foldable telescope of 24 m aperture and 9.6 m focal length, composed of 37 rigid hexagonal panels, which will fit within the 4.5 m diameter x 18 m long payload limits of space shuttle. As here conceived, the telescope would be a free flyer with its own power and pointing systems. Some of the structural design features and construction procedures are considered. Author

N77-33410*# Kanner (Leo) Associates, Redwood City, Calif.
SUPERCONDUCTIVITY OF POLAR MANY-VALLEY SEMICONDUCTORS AND SEMIMETALS
A. M. Gabovich and E. A. Pashitskiy Oct. 1977 19 p refs Transl. into ENGLISH from Fiz. Nizkikh Temperatur (Kiev), v. 2, no. 6, 1976 p 696-705
(Contract NASw-2790)
(NASA-TM-75141) Avail: NTIS HC A02/MF A01 CSCL 09C

A polar, degenerate semiconductor with two equivalent isotropic valleys, and a semimetal with equal effective masses for the holes and electrons were studied within the framework of a modified Gurevich-Larkin-Firsov model by taking into account the intervalley pairing. Concentration dependencies are found for the critical temperature which agree qualitatively with experimental data for SrTiO3 and BaPb(1-x)Bi(x)O3. Author

N77-33411*# Pennsylvania State Univ., University Park. Electrical Engineering Dept.
SURFACE CHARGE KINETICS NEAR METAL-DIELECTRIC INTERFACES EXPOSED TO KILOVOLT ELECTRON FLUX Final Report
James W. Robinson Sep. 1977 65 p refs
(Grant NsG-3097)
(NASA-CR-155195) Avail: NTIS HC A04/MF A01 CSCL 09C

Interfaces between dielectric films and grounded metallic boundaries were exposed, in vacuum, to monoenergic electron fluxes having energies up to 22 keV. Two principal concerns were the measuring of the charge distributions on dielectrics and the determining of causes of flashovers, events where dielectric surface charges abruptly transfer to the metallic structures. Surface charges are perturbed within 10 mm of interfaces. Perturbations are relatively small except within about 3 mm of the interface. The probability of flashover was found to be related to microscopic imperfections in the interfaces. As flashovers occur in an exposed metal substrate, points become burned into the dielectric along the slit. As these points develop, the probability of flashover increases greatly. An interface which is highly immune to flashover was formed by covering a dielectric film with a 1.5-mm-thick aperture plate which exposes the film through a machined opening. Author

N77-33412# Office of Naval Research, London (England).
CONFERENCE ON LUMINESCENCE PROCESSES IN CATHODE-RAY TUBES AND LAMPS
James H. Schulman 18 May 1977 13 p Conf. held at Weybridge, Surrey, England, March 1977
(AD-A041443; ONRL-C-4-77) Avail: NTIS HC A02/MF A01 CSCL 20/4

This Europhysics study Conference on phosphors dealt with inorganic-impurity-activated phosphors used in cathode-ray tubes, fluorescent lamps, and X-ray screens. Most emphasis was given to the saturation effects in cathode-ray excitation of phosphors and the general problems of energy absorption, localization, transfer and emission in these phosphors. Author (GRA)

N77-33413# General Electric Co., Utica, N. Y. Aerospace Electronic Systems Dept.

SOLDERABILITY TESTING OF MICROCIRCUITS Final Technical Report, 13 May 1976 - 13 Mar. 1977
R. Oehme, G. Schaefer, R. Ward, and L. Zakraysek Griffiss AFB, N. Y. RADC May 1977 57 p refs
(Contract F30602-76-C-0284)
(AD-A041203; RADC-TR-77-176) Avail: NTIS HC A04/MF A01 CSCL 13/8

Solderability tests were performed on Fe-Ni-Co and Fe-Ni microelectronic lead base materials with surface preparations as required by MIL-M-38510C. Test samples were used from four different sources. The solderability tests included MIL-STD-883A, Meniscograph and Hot Iron methods. Sample data from the three test methods showed good correlation. Microelectronic lead aging studies showed that the current steam aging environment should be retained. Author (GRA)

N77-33414# Varian Associates, San Carlos, Calif. FIMAC Div.
MANUFACTURING METHODS AND TECHNOLOGY (MMTE) MEASURE FOR FABRICATION OF LOW VOLTAGE START SEALED BEAM ARC LAMPS Quarterly Progress Report, 1 Dec. 1976 - 28 Feb. 1977
Edwin Chan, Tim Bell, and Roy D. Roberts 1 Apr. 1977 50 p
(Contract DAAB07-76-C-0034)
(AD-A041517; EIMAC-QPR-76-3) Avail: NTIS HC A03/MF A01 CSCL 13/1

A program is in progress to establish a production capability for the purpose of meeting estimated military needs for the X6335, a 1 kW sealed beam xenon arc lamp with low voltage starting mechanism. In accordance with the requirements of the contract, the second engineering sample was delivered. The safety requirement to avoid damage from explosion or overpressure has been achieved in the fabrication of the depressurize plug. The rupture disc within the depressurize plug has met the blowout specifications to function above the normal operating pressure of the lamp and below the lamp's explosion point. A xenon lamp optical and cooling assembly was designed and fabricated for adaptability in searchlight applications. GRA

N77-33415# Varian Associates, Palo Alto, Calif.
MILLIMETER WAVE GYROTRON DEVELOPMENT, PHASE 1 Final Technical Report, 25 Mar. 1976 - 30 Apr. 1977
Howard R. Jory Jun. 1977 73 p refs
(Contract F30602-76-C-0237; ARPA Order C-192)
(AD-A041596; RADC-TR-77-210) Avail: NTIS HC A04/MF A01 CSCL 09/5

This report describes Phase I of a program to develop a high-power 94 GHz amplifier based on the gyrotron or cyclotron resonance interaction. Ultimate goals are 100 kw peak power, 5 to 10 kW average power, 1 to 10% bandwidth, 30% beam efficiency, and 30 dB gain. The experimental work in Phase I has been performed at X-band to demonstrate feasibility of this approach. The first section of this report contains a review of previous work on cyclotron resonance devices. This is followed by the analysis of a number of cyclotron harmonic interactions with TE01 and TEn1 cylindrical fields. The next section describes the design of an X-band gyroklystron amplifier. A calculation of a large-signal power output is included which predicts an efficiency from beam power to microwave output of 36%. A computer simulation of the gun and beam performance is presented. Initial measured results for the experimental amplifier are presented. The maximum measured gain was 9 - 10 dB. The gain was limited by an interfering oscillation which prevented full optimization of the beam parameters. One oscillation produced an output power of 19.5 kw peak with an efficiency of 9.8%. An analysis is included to predict the bandwidth of gyroklystrons at 94 GHz. Bandwidths of 1 t0 4% are predicted with the fundamental interaction which requires a superconducting magnet. GRA

N77-33416# Purdue Research Foundation, Lafayette, Ind.
THE EFFECTS OF SUBSTRATE COMPOSITION ON THICK FILM CIRCUIT RELIABILITY Quarterly Report, 1 Feb. - 30 Apr. 1977
R. W. Vest 31 May 1977 21 p refs
(Contract N00019-77-C-0327)
(AD-A041572; QR-1) Avail: NTIS HC A02/MF A01 CSCL 09/1

The initial stage sintering kinetics for lead borosilicate glass of two compositions were studied in order to determine the effects of glass composition on the surface tension to viscosity ratio. The glass with the higher PbO content had a surface tension to viscosity ratio higher by a factor of 100 and an activation energy higher by a factor of two. Techniques have been developed for fabricating thick film resistors without changes in glass composition due to resistor-substrate interactions in processing. Author (GRA)

N77-33417# Varian Associates, Palo Alto, Calif. Microwave Tube Div.
EXTENDED BANDWIDTH VTS-5753B1 COUPLED CAVITY TRAVELING WAVE TUBE Final Technical Report, Apr. 1976 - Feb. 1977
Robert Giebler Jun. 1977 116 p
(Contract F30602-76-C-0232)
(AD-A041564; RADC-TR-77-174) Avail: NTIS MF A01 CSCL 09/5

The objective of this effort was to establish sufficient data on the VTS-5753 family of coupled cavity traveling wave tubes to enable evaluation of the tube's capabilities in a tactical, ECCM environment. This was accomplished by the development of an extended bandwidth tube capable of transmitting sophisticated radar waveforms that have low ECM susceptibility and extensive testing of the resultant tube. This project was highly successful in both respects. A tube of the VTS5753 family was developed, the VTS5753B1, that has a 200 MHz wider bandwidth than the previous version of the tube. Secondly, the testing program has supplied data invaluable to system designers/analysts that will allow them to incorporate tube nonlinearities into the overall system design. Author (GRA)

N77-33418# Varian Associates, Palo Alto, Calif. Solid State West Div.
INDIUM PHOSPHIDE GUNN DEVICES, 26-40 GHz Final Report, 1 Nov. 1975 - 31 Oct. 1976
R. J. Hamilton, Jr., S. I. Long, and R. D. Fairman Dec. 1976 94 p refs
(Contract N00123-76-C-0265)
(AD-A041329) Avail: NTIS HC A05/MF A01 CSCL 09/5

This report covers the period from 1 November 1975 through 31 October 1976 on a research and development program for low noise wideband InP Gunn devices for use in the 26.5 to 40 GHz band. Other performance objectives were: instantaneous bandwidth, 5 GHz; noise figure, 7-9 dB; minimum gain (over 5 GHz), 6 dB. Significant progress has been made in this one-year program in the areas of InP epitaxial growth and material evaluation, device design and fabrication, and test circuit development. It has been verified that InP Gunn devices offer important advantages over GaAs devices in noise figure performance as wideband amplifiers. Noise figures up to 13 dB lower than flat profile and 7 dB lower than cathode notch profile GaAs devices have been demonstrated. Additionally, as solid state components, they will offer significant advantages over conventional means of providing wideband, high gain, low noise amplification in the millimeter wave frequency range.
Author (GRA)

N77-33419# Edgerton, Germeshausen and Grier, Inc., Salem, Mass. Electronic Components Div.
REPETITIVE SERIES INTERRUPTER II Triannual Report, 1 Jan. - 28 Feb. 1977
Robert Simon and David V. Turnquist May 1977 42 p
(Contract DAAB07-76-C-1301)
(AD-A041144; ECOM-76-1301-3) Avail: NTIS HC A03/MF A01 CSCL 09/1

This report describes work performed from 1 Jan. 77 through 28 Feb. 77 on the Repetitive Series Interrupter, a hydrogen thyratron modified for opening switch operation. A description is given of two tubes designed for optical study of current interruption, and of results obtained from them. Experimental modifications are discussed and new designs for experimental interrupters are outlined. Author (GRA)

N77-33420# Edgerton, Germeshausen and Grier, Inc., Salem, Mass. Electronic Components Div.

FORTY KILOVOLT MEGAWATT AVERAGE POWER THYRATRON (MAPS 40) Interim Technical Report, 20 May - 31 Dec. 1976

J. J. Hamilton and D. V. Turnquist May 1977 25 p
(Contract DAAB07-76-C-1352)
(AD-A042082; ECOM-76-1352-I) Avail: NTIS HC A02/MF A01 CSCL 09/1

The purpose of this 12 month program is to develop a 40 kilovolt-megawatt average power thyratron. Electrical objectives are to switch 40 kiloamperes at 40 kilovolts with a pulse width of 10 microseconds and a repetition rate of 125 hertz. A thyratron design to meet these objectives has been evolved. The design has been evaluated for thermal and mechanical characteristics. Two preliminary devices have been fabricated and tested at ECOM at 70% of the average power level objectives. Author (GRA)

N77-33421# Naval Research Lab., Washington, D. C.
SUPERCONDUCTING MAGNETIC CALIBRATION SOURCE FOR MAGNETIC ANOMALY DETECTION MAD OPERATIONS

M. Nisenoff, J. J. Kennedy, and A. W. Webb Jun. 1977 43 p
(AD-A041738; NRL-MR-3534) Avail: NTIS HC A03/MF A01 CSCL 17/6

A superconducting solenoid was designed, built and tested to demonstrate the feasibility of using this type of device as a calibration source for Magnetic Anomaly Detection operations. A description of the dewar system required for such a solenoid is also described. The magnetic moment of the solenoid which was 48 cm in outer diameter, was 150,000 ampere-turns-meter squared. Author (GRA)

N77-33422# Jaros, Baum and Bolles, Los Angeles, Calif.
FEASIBILITY STUDY OF A 400 Hz, 4160 VOLT 3-PHASE ELECTRICAL POWER DISTRIBUTION SYSTEM

25 Feb. 1977 288 p refs
(Contract N00025-76-C-0011)
(AD-A042042) Avail: NTIS HC A13/MF A01 CSCL 10/2

This study has determined the feasibility of using a centralized 400 Hz power system. The benefits of a 4160 Volt 3-phase power distribution system are the economic advantages over individual generator units and the higher degree of reliability offered by the high frequency system. Author (GRA)

N77-33423# Erie Technological Products of Canada Ltd., Trenton (Ontario).
MANUFACTURING METHODS AND TECHNIQUES FOR MINIATURE HIGH VOLTAGE HYBRID MULTIPLIER MODULES Quarterly Report, 1 Oct. - 31 Dec. 1976

Michael Korwin-Pawlowski 6 May 1977 46 p Prepared for Can. Commercial Corp., Ottawa
(Contract DAAB07-76-C-0041)
(AD-A041765; QR-2) Avail: NTIS HC A03/MF A01 CSCL 10/2

The progress of the Manufacturing Methods and Technology Program for Miniature High Voltage Multiplier Modules is described in this Second Quarterly Report. Work was concentrated on the design of the module's components - the capacitors, substrates and rectifiers. Rectangular multipliers were fabricated and tested. Author (GRA)

N77-33424# Illinois Univ., Urbana-Champaign. Dept. of Computer Science.
DIGITAL FILTERING USING BURST PROCESSING TECHNIQUES M.S. Thesis

David Kevin Wells Jul. 1977 72 p refs
(Contract N00014-75-C-0982)
(AD-A042657; UIUCDCS-R-77-871; UILU-ENG-77-1736) Avail: NTIS HC A04/MF A01 CSCL 09/4

This paper covers the use of Burst Processing in digital filtering. Design and analysis of Burst filters is discussed in detail. A digital radio is shown as demonstration of Burst filtering. Author (GRA)

N77-33425# Northrop Corp., Des Plaines, Ill.
LOW COST CROSSED-FIELD AMPLIFIER Final Technical Report

R. R. Moats Jun. 1977 55 p refs
(Contract DAAB07-75-C-1343)
(AD-A042666; ECOM-75-1343-F) Avail: NTIS HC A04/MF A01 CSCL 09/1

This work is directed toward the achievement of a lower cost slow-wave structure for an injected-beam crossed-field amplifier (IBCFA) than has heretofore been possible. For cost reduction, the meander type of structure is to be supported on an ECOM designed shaped-dielectric substrate instead of individual insulator bars. The slow-wave structure designed and built simulates the configuration of the shaped substrate, but is built using conventional technology. In other respects, the design of the tube is similar to a production line IBCFA. Performance of the first experimental model is considered, in general, representative of the capability of this design. Power output of more than 3 kW and over 30 percent efficiency was achieved in the middle of the 2-4 GHz band, measured with 20 dB gain. Performance in the lower half of the band degraded slowly as frequency was reduced below 2.6 GHz, and degraded more rapidly as frequency was increased above 3.4 GHz. A CFA built with a simulated flat-substrate meander line produced somewhat less power output and efficiency, and less bandwidth, both total (with sole tuning) and instantaneous. Power output up to 2.6 kW with normal RF drive and beam power (as above) was achieved, with operation from 2 to 3.6 GHz. Design corrections for improved performance are foreseen. GRA

N77-33426# Brookhaven National Lab., Upton, N. Y. Accelerator Dept.
POWER TRANSMISSION PROJECT Progress Report through FY 1976

27 Dec. 1976 273 p refs
(Contract EY-76-C-02-0016; Grant NSF AG-381; EPRI Proj. 78-441)
(BNL-22202) Avail: NTIS HC A12/MF A01

A year's work on the development of helium cooled niobium tin superconducting cables for 550 kV or higher power transmission lines is summarized. Information is included on: (1) conductor research involving the fabrication, materials testing, and performance testing of Nb3Sn tapes; (2) design, materials testing and performance testing of cable insulation; (3) mechanical and cryogenic engineering of transmission line components and of test facilities; and (4) accumulated data on the design and testing of existing helium-cooled transmission lines in the Pennsylvania study. Author (ERA)

N77-33427# Westinghouse Electric Corp., Pittsburgh, Pa. Central Research Labs.
DEVELOPMENT OF CURRENT LIMITER USING VACUUM ARC CURRENT COMMUTATION. PHASE 1: A FEASIBILITY STUDY FOR USING ARC INSTABILITY IN VACUUM FOR CURRENT LIMITATION Final Report

C. W. Kimblin Mar. 1977 147 p refs
(EPRI Proj. 564-1)
(EPRI-EL-393) Avail: NTIS HC A07/MF A01

There is a stated need by the Electric Utilities for fast acting current limiting devices which insert appreciable impedance into power circuits. Insertion of this impedance during the initial rise of fault current reduces the fault current peak, and simplifies the interruption requirements of conventional circuit breakers. Reduction of the fault current peak also reduces the electromagnetic forces which would otherwise damage circuit components such as power transformers, line traps, bus structures, disconnect switches, and breakers. A current limiter using vacuum arc current commutation is being developed. Progress in Phase 1 of the program is reported. The use of forced instability of vacuum arcs to insert an impedance into the line during the fault current rise was investigated. It was found that application of a transverse magnetic field is an effective and attractive method for causing current commutation into a current limiting resistor. The interaction of vacuum arcs with applied transverse fields was analyzed theoretically and experimentally. ERA

N77-33428# Addis Translations International, Portola Valley, Calif.
HIGH SPEED FOIL BREAKERS

A. B. Andrezen, V. A. Burtsev, V. M. Vodovozov, V. A. Dubanskii, N. P. Egorov, V. N. Litunovskii, V. A. Ovsannikov, A. B. Produvnov, V. F. Prokopenko, and I. V. Shestakov Mar. 1977 25 p refs Transl. into ENGLISH from Russian Report, NIIEFA preprint

K-0292, 1976 27 p Prepared for LLL Sponsored by ERDA
(UCRL-Trans-11226) Avail: NTIS HC A02/MF A01

An experimental investigation of the electric explosion of aluminum foil in different arc-quenching media is presented. A study of the operating characteristics of foil circuit-breakers and of their practical use in a high speed theta-pinch power supply system was accomplished. Results are given for both evaluations. ERA

N77-33429# Addis Translations International, Portola Valley, Calif.
STUDY OF ELECTRIC EXPLOSION OF CYLINDRICAL FOILS IN AIR
V. A. Burtsev, V. A. Dubanskii, M. P. Kasatkina, A. B. Produvnov, and I. V. Shustakov Mar. 1977 33 p refs Transl. into ENGLISH from Russian report, NIIEFA preprint K-0293, 1976, 38 p Prepared for LLL Sponsored by ERDA
(UCRL-Trans-11227) Avail: NTIS HC A03/MF A01

An experimental investigation of the characteristics of an electric explosion of cylindrical foil in air, and of the properties of the electric-discharge plasma of a heavy-current discharge was made. The unusually large energy expenditure in explosions of flat foil at high current densities, and the incomplete vaporization of the metal at lower densities, both observed earlier, were confirmed. A study was made of the radiation characteristics of a heavy-current discharge in air and in metal vapors. An effect is noted involving a sharpening of the light pulse of an electric discharge plasma having the character of a continuous emitter. ERA

N77-33430# Westinghouse Electric Corp., Pittsburgh, Pa.
ANALYSIS AND FORECAST OF ELECTRICAL DISTRIBUTION SYSTEM MATERIALS. VOLUME 3: APPENDIX Final Report
C. G. Love 23 Aug. 1976 311 p refs
(Contract E(49-18)-2050)
(CONS/2050-1-Vol-3-App) Avail: NTIS HC A14/MF A01

These appendixes contain the detailed electrical distribution equipment requirements and input material requirements forecasts. Forcasts are given for three electric energy usage scenarios. Also included are data on worldwide reserves and demand for 30 raw materials required for the manufacture of electrical distribution equipment. ERA

N77-33431# Oak Ridge Y-12 Plant, Tenn.
USE OF A MICROPROCESSOR-BASED INTERACTIVE SYSTEM TO INCREASE PRODUCTION OF PRINTED WIRING BOARD ARTWORK
J. E. Hopwood Apr. 1977 71 p
(Contract EY-76-C-04-0789)
(SAND-77-8503) Avail: NTIS HC A04/MF A01

A microprocessor-based, stored-program controller was developed to format output data from a coordinate digitizer and transmit it to a remote computer, and eliminate thereby manual handling of punched cards. The instrument, known as the digitizer interactive processor, improved the efficiency of producing artwork for printed wiring boards. ERA

N77-33432# Little (Arthur D.), Inc., Cambridge, Mass.
STUDY OF UNDERGROUND POWER CABLE INSTALLATION METHODS
J. Nicol Apr. 1977 106 p refs
(Contract EX-76-C-01-1824; EPRI Proj. 7824)
(EPRI-EL-374) Avail: NTIS HC A06/MF A01

Detailed examination of the various installation steps was made and a range of costs was presented for each. After analyzing those higher cost steps for each cable type studied, various technologies were identified that could reduce these costs if utilities adopted these methods for use in other areas of construction. The result of these analyses was to recommend research and development in three general areas of installation procedure: (1) route planning and design; (2) pavement and soil removal; and (3) pipe installation methods. Recommendations in the route planning and design area were: (1) improved computer routing; (2) subsurface preliminary surveying; (3) thermal analysis of in-situ soils; (4) backfill material; and (5) how cable circuits are geometrically arranged in the trench. In pavement and soil removal, recommendations for improved methods yielded topics in the areas of; (1) microwave, plasma torch and water jet concrete cutting; (2) improved guided boring systems; (3) shoring techniques; and (4) soil removal systems. ERA

N77-33433# Moleculon Research Corp., Cambridge, Mass.
PROGRAM TO EVALUATE, DEVELOP, AND TEST POROPLASTIC MATERIALS AS IMPROVED ELECTRICAL INSULATION FOR HIGH POWER UNDERGROUND CABLES
L. D. Nicols, L. Gilson, and A. S. Obermayer Apr. 1977 66 p
(EPRI Proj. 7842-1)
(EPRI-EL-312) Avail: NTIS HC A04/MF A01

Results are presented of a project to develop Poroplastic Film, an ultramicroporous material used as a low substitute for the cellulose paper tapes presently used in the manufacture of high pressure oil-filled cable. Structurally, Poroplastic is a stable film consisting of a cellulose triacetate matrix which incorporated a large column of liquid. Pore diameters in the matrix measure several tens of Angstroms and the relative liquid volume can be controlled to range from as little as 50 percent to as much as 95 percent. The dimensional stability of the film is dependent on the presence of the liquid within the matrix; loss of liquid through evaporation or high pressure expulsion leads to irreversible collapse of the matrix. For use as a cable dielectric, the liquid incorporated in the Poroplastic was a dielectric oil. The material exhibited dielectric properties superior to those of cellulose paper. ERA

N77-33434# National Bureau of Standards, Washington, D. C. Inst. for Applied Technology.
PERFORMANCE OF BRANCH CIRCUIT ELECTRICAL TERMINATIONS OF COPPER AND ALUMINUM NONMETALLIC SHEATHED CABLE Final Report
Larry W. Masters, Elizabeth J. Clark, and Edward J. Embree Nov. 1976 35 p refs Sponsored in part by the Navy, AF, and the Army
(PB-267221/0; NBSIR-76-1184) Avail: NTIS HC A03/MF A01 CSCL 09C

A study was performed to provide guidelines regarding the use of aluminum branch circuit wiring in military buildings. Military bases which contain buildings with aluminum wired branch circuits were identified. Personnel at a number of the bases were contacted in order to estimate the extent of observed problems. Laboratory tests were performed on duplex receptacles wired with both aluminum and copper nonmetallic sheathed cable. Overheating of aluminum wired termination points was observed with some receptacles in a current cycling test. The findings of the study are presented and guidelines regarding the use of aluminum branch circuit wiring in military buildings are included. GRA

N77-33435# Mitre Corp., Bedford, Mass.
TIME DIVISION MULTIPLEX FRAME SYNCHRONIZATION: ACQUISITION, MAINTENANCE AND REACQUISITION
A. E. Post Jun. 1977 37 p refs
(Contract F19628-77-C-0001)
(AD-A041384; MTR-3375; ESD-TR-77-134) Avail: NTIS HC A03/MF A01 CSCL 09/4

A technique that can be employed to analyze the performance of proposed frame synchronization methods is presented. Candidate frame sync algorithms have two modes of operation: acquisition and verification. A time-invariant Markov chain approach is used to model the state of the synchronization process for any time period beyond an assumed initial state. An example problem, demonstrating a number of special, computational adaptations, was worked. Although the use of only a single sync bit per frame is illustrated, the approach can be extended to a broader class of problems. Author (GRA)

N77-33436# Bendix Corp., Baltimore, Md. Communications Div.
TACTICAL MINIATURE CRYSTAL OSCILLATOR Semiannual Report, 15 Oct. 1975 - 15 Jun. 1976
H. M. Greenhouse and R. L. McGill Jun. 1977 50 p
(Contract DAAB07-75-C-1327)
(AD-A041411; ECOM-75-1327-2; Rept-471-2583-1021) Avail: NTIS HC A03/MF A01 CSCL 09/5

This report describes the further development of a fast warmup Tactical Miniature Crystal Oscillator (TMXO). The intended use

for the TMXO is as a reference frequency source in advanced tactical communications systems and in time ordered navigational systems. The present effort is a continuation by the authors of a previous study which defined particular problem areas. The TMXO is an evacuated enclosure containing a thermal insulating pedestal, a vacuum sealed hybrid microcircuit and a thermally isotropic back filled crystal unit. Both packages are supported by the pedestal. Changes in the design and performance of delivered models are described. Author (GRA)

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N77-33437*# Southwest Research Inst., San Antonio, Tex.
STUDY OF LIQUID JET IMPINGEMENT ON SCREENS Final Report
Franklin T. Dodge and Randall E. Ricker Sep. 1976 50 p refs
(Contract NAS3-20086)
(NASA-CR-135260; SwRI-02-4492) Avail: NTIS HC A03/MF A01 CSCL 20D

A model is presented for an unconfined flow, such as a free jet, impinging on a screen which incorporates the influence of liquid deflection by the screen. The boundary layer blockage coefficient is introduced. This coefficient depends on the screen weave geometry and the jet impingement angle, and essentially accounts for the increase in fluid particle trajectory length through the screen resulting from the flow deflection. Comparisons were made with previous experimental studies to determine empirical values of the blockage coefficient. It is concluded that the new model reliably predicts the bulk flow and penetration characteristics of an impinging liquid jet interacting with a screen. Author

N77-33438*# Old Dominion Univ. Research Foundation, Norfolk, Va.
COMPUTATIONS IN TURBULENT FLOWS AND OFF-DESIGN PERFORMANCE PREDICTIONS FOR AIRFRAME-INTEGRATED SCRAMJETS Final Report
G. L. Goglia and E. Spiegler Oct. 1977 12 p refs
(Grant NsG-1348)
(NASA-CR-155053) Avail: NTIS HC A02/MF A01 CSCL 20D

The research activity focused on two main tasks: (1) the further development of the SCRAM program and, in particular, the addition of a procedure for modeling the mechanism of the internal adjustment process of the flow, in response to the imposed thermal load across the combustor and (2) the development of a numerical code for the computation of the variation of concentrations throughout a turbulent field, where finite-rate reactions occur. The code also includes an estimation of the effect of the phenomenon called 'unmixedness'. Author

N77-33439*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
INVESTIGATION OF SUPERSONIC TURBULENT BOUNDARY-LAYER SEPARATION ON A COMPRESSION RAMP BY AN INTEGRAL METHOD
D. K. Patel and K. R. Czarnecki Oct. 1977 62 p refs
(NASA-TM-74065) Avail: NTIS HC A04/MF A01 CSCL 20D

An investigation was made to determine the feasibility of using a boundary layer integral method to study the separation of a turbulent boundary layer on a two dimensional ramp at supersonic speeds. The numerical calculations were made for a free stream Mach number of 3, a Reynolds number of 10 million, and over a ramp angle range from 0 deg to 30 deg. For ramp angles where no flow separation was indicated, theoretical calculations were in reasonable agreement with experimental data except for a somewhat belated rise in pressure. For larger ramp angles, where separation was present, the investigation produced results that were not in agreement with experiment or with results calculated by time dependent Navier-Stokes methods. This apparently was true because no provision had been made for a proper shock boundary layer interaction where strong normal pressure gradients are induced within the boundary layer under the shock independent of surface curvature effects. Author

N77-33440*# Washington Univ., Seattle. Dept. of Mechanical Engineering.
AN EXPERIMENTAL INVESTIGATION OF SHOCK WAVE-TURBULENT BOUNDARY LAYER INTERACTIONS WITH AND WITHOUT BOUNDARY LAYER SUCTION: A DATA SUMMARY REPORT
Chen-Chih Sun and Morris E. Childs Aug. 1977 907 p refs
(Grant NGL-48-002-047)
(NASA-CR-2872) Avail: NTIS HC A99/MF A01 CSCL 20D

Tabulated data from a series of experimental studies of the interaction of a shock wave with a turbulent boundary layer in axisymmetric flow configurations is presented. The studies were conducted at the walls of circular wind tunnels and on the cylindrical centerbody of an annular flow channel. Detailed pitot pressure profiles and wall static pressure profiles upstream of, within and downstream of the interaction region are given. Results are presented for flows at nominal freestream Mach Numbers of 2, 3 and 4. For studies at the tunnel sidewalls, the shock waves were produced by conical shock generators mounted on the centerline of the wind tunnel at zero angle of attack. The annular ring generator was used to produce the shock wave at the centerbody of the annular flow channel. The effects of boundary layer bleed were examined in the investigation. Both bleed rate and bleed location were studied. Most of the bleed studies were conducted with bleed holes drilled normal to the wall surface but the effects of slot suction were also examined. A summary of the principal results and conclusions is given. Author

N77-33441# Grumman Aerospace Corp., Bethpage, N.Y. Fluid Dynamics.
SUBSONIC DIFFUSER WITH INJECTION FLOW
Shuh-Jing Ying Oct. 1977 34 p refs Sponsored by NSF
(RM-644) Avail: NTIS HC A03/MF A01 CSCL 20D

Subsonic flow in a diffuser with injection flow along the boundary was analyzed by a one dimensional flow model which included the effects of compressibility and viscosity. The velocity, pressure, and density distributions were obtained as was the maximum porosity fraction for the injection flow. A two dimensional model assumed the flow as the combination of inner flow and boundary layer flow. Compressible viscous fluid flow was considered for the inner flow and incompressible viscous fluid for the boundary layer flow. The flow was analyzed by a numerical scheme. Results were reasonable as checked by the conservation of mass constraint. A modified diffuser model with a segmented duct was tested. Pressure measurements showed that the flow was uniform downstream of the diffuser but total pressure dropped excessively. Author

N77-33442*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EXPERIMENTAL DESIGN STUDIES AND FLOW VISUALIZATION OF PROPORTIONAL LAMINAR-FLOW FLUIDIC AMPLIFIERS
R. F. Hellbaum and J. N. McDermon Washington Aug. 1977 40 p refs Film Supplement Number L-1228 to this report is available on loan from NASA Langley Research Center att: Photographic Branch, mail stop 425 Hampton, Va. 23665 Original contains color illustrations
(NASA-TN-D-8433; L-10868) Avail: NTIS HC A03/MF A01 CSCL 20D

The effects of certain parameter variations on the performance characteristics of laminar, proportional, jet-deflection fluidic amplifiers were studied. The matching and staging of amplifiers to obtain high pressure gain was included, but dynamic effects were not. The parameter variations considered were aspect ratio, setback, control length, splitter distance, receiver-duct width, width of center-vent duct, and bias pressure. Usable pressure gains of 19 per stage were achieved, and 5 amplifier stages were integrated to yield an overall pressure gain of 2,000,000. Author

N77-33443*# Texas A&M Univ., College Station. Dept. of Physics.

RADIATIVE TRANSFER IN SPHERICAL SHELL ATMOSPHERES. 2: ASYMMETRIC PHASE FUNCTIONS
George W. Kattawar and Charles N. Adams 22 Sep. 1977 27 p ref Submitted for publication
(Grant NGR-44-001-117)
(NASA-CR-155162; Rept-37) Avail: NTIS HC A03/MF A01 CSCL 20D

The effects are investigated of sphericity on the radiation reflected from a planet with a homogeneous, conservative scattering atmosphere of optical thicknesses of 0.25 and 1.0. A Henyey-Greenstein phase function with asymmetry factors of 0.5 and 0.7 is considered. Significant differences were found when these results were compared with the plane-parallel calculations. Also large violations of the reciprocity theorem, which is only true for plane-parallel calculations, were noted. Results are presented for the radiance versus height distributions as a function of planetary phase angle. Author

N77-33444*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
VAPOR INGESTION IN CENTAUR LIQUID-HYDROGEN TANK
Eugene P. Symons Oct. 1977 31 p refs
(NASA-TP-1061; E-9234) Avail: NTIS HC A03/MF A01 CSCL 20D

Vapor ingestion phenomena were investigated using scale models of the Centaur liquid hydrogen tank to determine the height of the free surface of the liquid when vapor is intially ingested into the tank outlet. Data ars compared with an analysis and, in general, the agreement is very good. Predictions are presented for minimum liquid levels required in the Centaur liquid hydrogen tank in order to prevent vapor ingestion when restarting the engines in space and the quantities of liquid remaining in the tank at vapor ingestion during main engine firing Author

N77-33445# Office of Naval Research, London (England).
FROM SOUP TO NUTS: THE 7TH INTERNATIONAL CONGRESS ON RHEOLOGY
E. A. Kearsley 28 Dec. 1976 20 p Conf. held at Gothenberg, Sweden, 23-27 Aug. 1976
(AD-A041227; ONRL-C-32-76) Avail: NTIS HC A02/MF A01 CSCL 20/4

Brief summaries are given of many of the 270 papers presented and an effort has been made to develop an overall impression of what is going on in rheology these days. The report is meant to serve as a Guide Michelin to the tourist travelling through the proceedings. Topical coverage includes constitutive equations for polymers, crystalline polymers, rubber elasticity, dilute solution theory, extensional and convergent flows of melts and solutions, chemorheology and aging, birefringence in polymers, block polymers, thermodynamics of viscoelasticity, rheological fluid mechanics, new devices and measurement techniques, technological polymer rheology, melt fracture, failure of plastics, drag reduction, biorheology, granular media, metals, paper and cloth, and gases. Author (GRA)

N77-33446# Aerospace Corp., El Segundo, Calif. Vehicle Engineering Div.
A NUMERICAL STUDY OF NONLINEAR EFFECTS ON BOUNDARY-LAYER STABILITY Final Report
John W. Murdock 28 Feb. 1977 36 p refs
(Contract F04701-76-C-0077)
(AD-A041088; TR-0077(2550-15)-4; SAMSO-TR-77-47) Avail: NTIS HC A03/MF A01 CSCL 20/4

A spectral scheme is used to solve for the unsteady, two-dimensional flow over a flat plate in the Reynolds number range of transition. Solutions to the full Navier-Stokes equations agree with solutions to the parabolized vorticity equations for the problems considered. The propagation of large amplitude (nonlinear) Tollmien-Schlichting waves in a boundary layer is studied; in some cases, these large amplitude waves are more unstable than linear waves. Analysis of the solutions shows that the relative phase of the first and second harmonics is related to the nonlinear stability of the waves. Author (GRA)

N77-33447# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio. Aeromechanics Div.
PREDICTION TECHNIQUES FOR THE CHARACTERISTICS OF FIN GENERATED THREE DIMENSIONAL SHOCK WAVE TURBULENT BOUNDARY LAYER INTERACTIONS Final Report, Jan. 1974 - Sep. 1976
James R. Hayes May 1977 68 p refs
(AD-A042024; AFFDL-TR-77-10) Avail: NTIS HC A04/MF A01 CSCL 20/4

The characteristics of the three-dimensional shock wave turbulent boundary layer interaction were investigated through an extensive experimental test program. This program encompassed Mach numbers from 2.95 to 5.85, Reynolds numbers of 1,500,000 per foot, and boundary layer thicknesses at the fin leading edge from 0.13 to 6 inches. Each test collected heat transfer, pressure, and oil flow data at selected fin deflection angles ranging from 0 to 20 deg. The objective was to generate a data base covering a wide enough range of parameters to allow the formulation of a set of inclusive prediction techniques for the major characteristics of the interaction. GRA

N77-33448# Purdue Univ., Lafayette, Ind. Fluid Mechanics Group.
COHERENT STRUCTURE OF A TURBULENT BOUNDARY LAYER IN A CONVECTED REFERENCE FRAME Annual Report, 1 May 1976 - 30 Apr. 1977
C. R. Smith, S. L. Huston, and J. J. Brown Jun. 1977 37 p refs
(Contract F44620-76-C-0099)
(AD-A041751; CFMTN-77-1; AFOSR-77-0793TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

This is an interim annual report for an ongoing research program studying coherent structure in turbulent boundary layers. The design and development of a water channel facility for use in flow visualization studies of coherent turbulent boundary structure is described. The particularly unique aspects of this facility include the incorporation of (1) a moving reference (viewing) platform for study of relative motion effects and (2) a closed circuit television monitoring and recording system. Preliminary flow visualization results are presented for both a fixed and moving reference frame, and a tentative vortex-loop model of coherent turbulent boundary layer structure is proposed. Computer simulations of a transverse structure in a turbulent boundary layer are presented showing a remarkable similarity with experimental flow visualization results. Research directions for the following year are outlined. Author (GRA)

N77-33449# Ballistic Research Labs., Aberdeen Proving Ground, Md.
SHOCK WAVE ATTENUATION BY PERFORATED PLATES WITH VARIOUS HOLE SIZES Final Report
Charles Kingery, Richard Pearson, and George Coulter Jun. 1977 66 p ref
(AD-A041854; BRL-MR-2757) Avail: NTIS HC A04/MF A01 CSCL 20/11

Results are presented for a set of experiments designed to determine the attenuation of shock waves passing through perforated plates as a function of peak overpressure and hole size for a given percentage of plate area vented. The venting hole size was varied from 1/8 inch (0.32 cm) to 2-13/16 inches (7.14 cm) as the vented area was varied from 5-50 percent open. The perforated plates were exposed to shock waves in a 4-inch (10.2 cm) shock tube over a range of peak shock overpressures from 200 psi (1379 kPa) down to 48 psi (331 kPa). Author (GRA)

N77-33450# Naval Postgraduate School, Monterey, Calif.
ON THE STABILITY OF TWO BASIC PARALLEL FLOWS: ANALYSIS, PROGRESS REPORT AND PROPOSAL FOR FURTHER RESEARCH
T. H. Gawain 1 Jun. 1977 61 p refs
(AD-A041946; NPS-67GN77061) Avail: NTIS HC A04/MF A01 CSCL 20/4

This report provides a detailed technical outline and evaluation of research on the hydrodynamic stability of plane Poiseuille flow and of pipe Poiseuille flow. Each case involves significant discrepancies between the predictions of conventional theory and the results of actual experimental observations. In particular, the conventional theory fails completely to account for the well known instability of ordinary pipe flow. This report describes a more general theory which shows promise of overcoming the

above limitations. The new theory involves a number of innovations in the formulation of some of the basic equations, in the formulation of certain boundary conditions, and in the formulation of the criterion of stability itself. The analytical work is essentially complete and preliminary calculations, while still of limited scope, appear to support the theory and are, therefore, quite encouraging. GRA

N77-33451# Naval Ship Research and Development Center, Bethesda, Md. Computation Mathematics/Logistics Dept.

NUMERICAL TREATMENT OF ARBITRARILY-SHAPED REGIONS IN FLUID DYNAMICS Summary Report

Joanna W. Schot Jun. 1977 18 p refs Proceedings of the Defense Exchange Meeting on Viscous and Interscting Flows, Goettingen, West Germany, 28-29 Apr. 1977

(AD-A041741; CMLD-77-14) Avail: NTIS HC A02/MF A01 CSCL 20/4

This paper addresses the need for improving and automating the numerical definition of arbitrarily-shaped flow regions and body surfaces for practical aerodynamic and hydrodynamic flow calculations. New techniques are described to use computers to generate accurate discretizations of complicated flow domains from a limited amount of input data. These methods improve both the speed and accuracy of solving complex flow problems. Author (GRA)

N77-33452# Brown Univ., Providence, R. I. Div. of Engineering.

ON THE LARGE-SCALE STRUCTURE IN TURBULENT FREE SHEAR FLOWS

J. T. C. Liu and A. Alper 1977 14 p refs Repr. from Proc. of Symp. on Turbulent Shear Flows, Apr. 1977 p 11.1-11.11 Presented at Symp. on Turbulent Shear Flows, University Park, Pa.

(Contract N00014-76-C-0363; Grant NSF ENG-73-04104)

(AD-A042348) Avail: NTIS HC A02/MF A01 CSCL 20/4

The existence of organized structures in turbulent shear flow has been the subject of recent observational discoveries in both the laboratory and in the atmosphere and ocean. The recent work on modeling such structures in a temporally developing, horizontally homogeneous turbulent free shear layer has been extended to the spatially developing mixing layer, there being no available rational transformation between the two nonlinear problems. The basis for the consideration is the kinetic energy development of the mean flow, large-scale structure and fine-grained turbulence with a conditional average, supplementing the usual time average, to separate the nonrandom from the random part of the fluctuations. The integrated form of the energy equations and the accompanying shape assumptions, is used to derive amplitude equations for the mean flow, characterized by the shear layer thickness, the nonrandom and random components of flow which are characterized by their respective energy densities. In general, the large-scale structure augments the spreading of the shear layer and enhances the fine-grained turbulence by taking energy from the mean flow and transferring it to the turbulence as it amplifies and subsequently decays. The maximal amplitude of the large-scale structure is attained by the initially most amplified mode, however, the relative enhancement of the fine-grained turbulence is achieved by both the magnitude of the large-scale structure and its streamwise lifetime. Thus a greater enhancement of the turbulence is achievable by the lower frequency modes which have longer streamwise lifetimes. The large-scale structure can also be controlled by increasing the initial level of turbulence, which would render its decay more rapidly. Author (GRA)

N77-33453# Aeronautical Research Council, London (England).

THE NUMERICAL CALCULATION OF STEADY INVISCID SUPERCRITICAL FLOW PAST ELLIPSOIDS WITHOUT CIRCULATION

P. W. Duck Aug. 1975 49 p Supersedes RAE-TR-75087 (AD-A041016; ARC-R/M-3794) Avail: NTIS HC A03/MF A01 CSCL 20/4

The previous work of the author in which the subcritical flow past ellipsoids was calculated is extended to supercritical flows. The same ellipsoidal coordinate system is used, the body-surface boundary-condition is then applied exactly (in the numerical sense). By means of a transformation of one of the coordinates, the infinite flow field is brought into a finite space for the calculation. The complete continuity equation is approximated by the usual central differencing in the elliptic (subcritical) regions, whilst in the hyperbolic (supercritical) regions, the combination of central and non-central differencing as suggested by Albone and Jameson is used, in order to model the absence of upstream propagation of disturbances. Although shock waves appear in the calculations their shape and position is only approximately determined (as e.g. in transonic small perturbation theory) since the difference scheme only ensures continuity of the potential across the shock, the Rankine-Hugoniot equations not being satisfied. A number of results is presented, for flows aligned along the major and second axes, and also yawed relative to these two axes. Author (GRA)

N77-33454# Illinois Univ., Urbana-Champaign. Dept. of Aeronautical and Astronautical Engineering.

DIRECT INITIATION OF DETONATION BY NON-IDEAL BLAST WAVES Interim Report

Robert John Cesarone Jun. 1977 96 p refs

(Grant AF-AFOSR-2524-73)

(AD-A042811; AAE-77-4; UILU-ENG-77-0504) Avail: NTIS HC A05/MF A01 CSCL 19/4

This study is a theoretical investigation of the initiation of detonation by nonideal blast waves. The study used the output of the CLOUD program as the source of flow data for blast waves generated by bursting spheres. Each cell that surrounds the bursting sphere is assumed to be reactive with an Arrhenius type kinetic rate law over a temperature range of from 1000 - 2700 K. Outside this range the cell is assumed to be nonreactive. In the technique the delay to explosion is integrated numerically from the time of shock passage over that cell until the temperature of the cell drops below 1000 K. A minimum of this summation time was found for cells either near the bursting sphere or right at the edge of the sphere. Conceptually, as the bursting sphere is made larger and larger one eventually reaches a point at which the delay time to explosion in at least one of the cells is long enough such that an explosion process can start. This is taken as the criterion for detonation initiation in this model. Numerous cases were run and initiation behavior was plotted both as a function of the total energy of the bursting sphere and the energy density of the bursting sphere. In addition, a few runs were made for the ramp edition of energy to compare to the bursting sphere results. The study shows that as the energy density of the sphere gas becomes lower the total energy required for initiation increases sharply. This is in agreement with experimental studies using spark initiation. Author (GRA)

N77-33455# Oak Ridge Gaseous Diffusion Plant, Tenn. Computing Applications Dept.

DERIVATION OF CONSERVATIVE FINITE DIFFERENCE EXPRESSIONS FOR THE NAVIER-STOKES EQUATIONS

J. N. Tunstall Apr. 1977 43 p refs

(Contract W-7405-eng-26)

(K/CSD-5) Avail: NTIS HC A03/MF A01

An analytical approach for obtaining conservative finite difference representations of the Navier-Stokes equations to be solved in a general two dimensional region is presented. A particular case of the approach is used to derive the finite difference equations for a quadrilateral cell that were reported in descriptions of arbitrary Lagrangian Eulerian computing techniques. The simplified equations for a rectangular mesh are also obtained so that comparison with finite difference equations specifically derived for rectangular meshes can be made. ERA

N77-33456# Sandia Labs., Albuquerque, N. Mex.

PFLASH: A PROGRAM TO CALCULATE FOURIER COSINE COEFFICIENTS FOR PRESSURE DISTRIBUTIONS

W. B. Leisher Aug. 1976 31 p refs

(Contract EY-76-C-04-0789)

(SAND-76-0280) Avail: NTIS HC A03/MF A01

PFLASH is a FORTRAN program written to convert measured body surface pressure/time histories into forcing function time histories for use with structural response computer codes. The program was developed for use on blast test data from explosively driven shock tubes. The test pressure data must be processed through a preliminary program, PROFIL, to be properly prepared for PFLASH. The conditions for use, algorithm, calculational

procedures, and constraints for PFLASH, as well as accuracies for the PROFIL-PFLASH combination are described. Example input and output listings are included. ERA

N77-33457# California Univ., Berkeley. Lawrence Berkeley Lab.
NUMERICAL INVESTIGATION OF CONFINED TURBULENT SHEAR FLOWS Ph.D. Thesis
P. S. Bernard Dec. 1976 162 p refs
(Contract W-7405-eng-48)
(LBL-5582) Avail: NTIS HC A08/MF A01

A derivation of the method of coarse graining for the computation of turbulent flows, one which strengthens and clarifies its theoretical foundation is presented. By the application of the method to the study of the turbulent flow in a channel and behind a piston in compressive motion it was shown that a promising start was made toward acquiring the ability to predict the mean properties of turbulent flows. The principal improvement in the method of coarse graining consists of the establishment of a general law of turbulent diffusion which applies to any scalar that is passively convected in a turbulent flow. The law is in the form of an expansion in roughly the Lagrangian integral time scale. The transport law is used to derive a closed set of equations for the mean vorticity and mean squared fluctuating vorticity. Other innovations include a more precise accounting of the effects of the local turbulence on the velocity moments and the use of an explicit equation for mean squared fluctuating vorticity instead of mean squared vorticity. ERA

N77-33458# Massachusetts Inst. of Tech., Oak Ridge, Tenn. School of Chemical Engineering Practice.
EFFICIENCY OF PARTICLE REMOVAL FROM VISCOUS LIQUIDS WITH A HYDROCLONE
T. Trinh, J. J. Monge, and W. A. Chrusciel 1 Oct. 1976 50 p refs
(Contract W-7405-eng-26)
(ORNL-MIT-237) Avail: NTIS HC A03/MF A01

The performance of a 10-mm, Dorr-Oliver hydroclone with up to 37 micrometers-diam dust or fly ash suspended in high viscosity streams was investigated. Liquid flow rates were varied from 0.9 to 4.4 1/min, and the viscosity ranged from 1 to 85 cp. The feed stream contained 5 wt% of particles. Pressure drop across the hydroclone was found to be dependent on flow rate and fluid viscosity. At low flow rates, pressure drop across the hydroclone appeared to increase with viscosity; whereas, at high flow rates this trend was reversed. Overall centrifugal efficiency was found to increase with flow rate and decrease with viscosity. A characteristic depression at small particle diameters and peak at large particle diameters were observed on plots of point efficiency against particle diameter. This trend could be caused by agglomeration of small particles to large aggregates. ERA

N77-33459# McElroy (Ralph) Co., Austin, Tex. Custom Div.
TEMPERATURE OSCILLATIONS AT CRITICAL TEMPERATURE IN TWO-PHASE FLOW
Roberto Brevi, Maurizio Cumo, Angelo Palmieri, and Domenico Pitimada Feb. 1977 40 p refs Transl. into ENGLISH of "Oscillazioni di Tempuratura alla Crisi Termica con Miscele", Comit. Nazl. Energia Nucl., Rome, 1969 34 p Sponsored by ERDA
(ANL-Trans-1083) Avail: NTIS HC A03/MF A01

Temperature oscillations, or thermal cycling, which occur with steam-water flow in once-through cooling systems at the critical temperature zone, i.e., when dryout occurs, are described. A theoretical analysis was done on the characteristic frequency of the oscillations, and the parameters upon which the operating characteristics and the physical properties of the fluid depend. The temperature distribution in the critical zone is analyzed, examining the thermal transitions that occur due to the rapid variations in the coefficient of heat transfer. ERA

N77-33460# Energy Research and Development Administration, Washington, D. C.
USE OF MINIATURE OPTICAL PROBES IN TWO-PHASE GAS-LIQUID FLOW
J. P. Galaup and J. M. Delhaye [1976] 29 p refs
(INEL-TR-10) Avail: NTIS HC A03/MF A01

The development and testing of an optical probe for measuring local void fraction and gas velocity in bubbly, bubbly-slug and slug flows is discussed. Previous studies of the use of optical probes for studying two-phase flow are reviewed. The equipment and procedures used are described. Void fraction measurement results are compared with the total average void fraction measured along the same diameter by a gamma-ray absorption method. Gas velocity measurements are compared with turbine flowmeter measurements of volume flow rate. It was concluded that the optical probe used is useful in the study of the local structure of two-phase flows, that a simple single probe permits measurement of the void fraction of one of the phases in a two-phase medium where the liquid is not an electrical conductor, and that a double probe with two sensing elements can be used to estimate the local velocity of the gaseous phase. ERA

N77-33461# Selskapet for Industriell og Teknisk Forskning, Trondheim (Norway). Div. of Structural Engineering.
RESERVOIR FLOW: TWO-PHASE INCOMPRESSIBLE FLOW
Vilgeir Dalen 19 Dec. 1974 56 p refs Sponsored partly by Roy. Norweg. Council for Sci. and Ind. Res.
(STF71-A74038; ISBN-82-595-0427-8) Avail: NTIS HC A04/MF A01

The equations governing the flow of two incompressible, immiscible fluids through a porous medium representative of a certain class of reservoir flow problems, namely, those involving movements of saturation fronts are summarized, and a solution method is described. The method is based on spatial discretization by the finite element formulation of the Galerkin method, time discretization by finite difference formulas, and Newton iteration for the solution of sets of nonlinear algebraic equations. A computer program for plane or axisymmetric flow is described, and several example problems, involving simultaneous flow of water and oil, are solved in order to illustrate the solution method and computer program.
Author (ESA) and Norweg. Petrol. Directorate

N77-33462# Selskapet for Industriell og Teknisk Forskning, Trondheim (Norway). Div. of Structural Engineering.
FLOW 22: USER'S DESCRIPTION
Vilgeir Dalen 18 Feb. 1975 58 p refs Sponsored by Roy. Norweg. Council for Sci. and Ind. Res.
(STF71-A75003; ISBN-82-595-0428-6) Avail: NTIS HC A04/MF A01

FLOW 22 is a program for the description of twodimensional (essentially plane or axisymmetric) flow of two immiscible, incompressible fluids through a porous medium. From an initial state and boundary conditions defined in terms of potentials (pressures) and/or discrete production rates at some nodal points, the saturation and potential distributions for any subsequent time stations may be calculated. Production rate and cumulative production, for both fluid phases and all nodal points at which fluids are produced or injected were calculated. The solution method is based on the spatial discretization by the finite element formulation of the Galerkin method; the time integration by finite difference formulas; the modified Newton iteration for the solution of sets of non-linear algebraic equations; and a direct method for the solution of the linearized equations. Author (ESA)

N77-33463# Selskapet for Industriell og Teknisk Forskning, Trondheim (Norway). Div. of Structural Engineering.
NUMERICAL SOLUTIONS OF THE BUCKLEY-LEVERETT PROBLEM
Vilgeir Dalen 20 Aug. 1975 52 p refs
(Contract NTNF-B-1840.4683)
(STF71-A75024; ISBN-82-595-0434-0) Avail: NTIS HC A04/MF A01

As part of a hydrocarbon reservoir simulation project, rigorous numerical solution techniques, including finite difference and finite element approximations, are described as applied to the classical Buckley-Leverett problem, i.e., the problem of one-dimensional simultaneous flow of two immiscible, incompressible fluids (water and oil) through a homogeneous porous medium (reservoir). Implicit as well as semi-implicit timestepping schemes were considered. The solution methods were applied to several example problems, illustrating the problems that are encountered when simulating displacement processes by these conventional numerical methods. The importance of a proper handling of the

relative permeabilities is pointed out. A mobility modification scheme is proposed and shown to have a very favorable effect on the finite element solutions. Author (ESA)

N77-33464# Selskapet for Industriell og Teknisk Forskning, Trondheim (Norway). Div. of Structural Engineering.

A FINITE ELEMENT MODEL FOR THE ANALYSIS OF WATERFLOOD PERFORMANCE

Vilgeir Dalen 5 Nov. 1975 62 p refs Sponsored by Norweg. Council for Sci. and Ind. Res.

(STF71-A75036; ISBN-82-595-0654-8) Avail: NTIS HC A04/MF A01

A mathematical model for waterflood performance is described and a numerical solution method is applied. This method is based on spatial discretization by the finite element formulation of the Galerkin method and a semi-implicit formulation in time. A computer program is briefly described, and several example problems are solved. The various alternatives included in the formulation of the solution method are compared, and guidance is given as to how the model is most efficiently applied. Author (ESA)

N77-33465# Selskapet for Industriell og Teknisk Forskning, Trondheim (Norway). Div. of Structural Engineering.

WFLOOD: USER'S DESCRIPTION. A SIMULATION MODEL FOR OIL RESERVOIRS SUBJECTED TO WATER-FLOODING

Vilgeir Dalen 26 Feb. 1976 39 p refs Sponsored by Roy. Norweg. Council for Sci. and Ind. Res.

(STF71-A76005; ISBN-82-595-0663-7) Avail: NTIS HC A03/MF A01

Based on the finite element method (the Galerkin formulation) and a semi-implicit incremental formulation in time, WFLOOD performs numerical simulation of the behavior of an oil reservoir subjected to waterflooding. WFLOOD is restricted to two-dimensional (areal) analysis and two flowing fluid phases (water and oil). Gravity, capillary pressure, and compressibility effects are neglected. WFLOOD is quite general with respect to geometry, heterogenities, and well conditions, and the program has restart capabilities. For a sequence of time stations, WFLOOD calculates the pressure and the water saturation at a set of discrete nodes. An arbitrary number of injection and production wells may be specified, and production rates, cumulative productions, etc., are calculated for each time station. Prescribed well conditions (rates or well pressures) may be updated at any pre-selected time. Author (ESA)

N77-33466# Selskapet for Industriell og Teknisk Forskning, Trondheim (Norway). Div. of Structural Engineering.

IMMISCIBLE FLOW BY FINITE ELEMENTS

Vilgeir Dalen 1 Jun. 1976 23 p refs Sponsored by Roy. Norweg. Council for Sci. and Ind. Res.

(STF71-A76017; ISBN-82-595-0833-8) Avail: NTIS HC A02/MF A01

A finite element approach to a two-phase frontal displacement problem is described. The solution method is based on the Galerkin method for spatial discretization and an iterative semi-implicit incremental formulation in time. It is easily extended to more complex multi-phase flow problems including the effects of compressibility, gravity, and capillary forces. Several one- and two-dimensional examples of application are included in order to illustrate the feasibility of the solution method. Author (ESA)

N77-33467# Selskapet for Industriell og Teknisk Forskning, Trondheim (Norway). Div. of Structural Engineering.

GASSIM. USER'S DESCRIPTION: A GAS RESERVOIR SIMULATION MODEL

Vilgeir Dalen 1 Jul. 1976 39 p refs

(Contract NTNF-B-1840.4683)

(STF71-A76020; ISBN-82-595-0834-6) Avail: NTIS HC A03/MF A01

A reservoir simulation model, GASSIM, for areal analysis of single-phase gas flow in a porous medium is described. This program performs numerical simulation of the performance of a gas reservoir and is restricted to two-dimensional horizontal flow. The gas may be considered as an ideal gas or an empirically defined real gas. Based on the finite element method for spatial discretization and an implicit incremental formulation in time, GASSIM is quite general with respect to geometry, reservoir heterogeneities, and well conditions; the program has restart capabilities. Author (ESA)

N77-33468# Technische Univ., Berlin (West Germany). Inst. fuer Luft- und Raumfahrt.

THEORETICAL AND EXPERIMENTAL INVESTIGATIONS ON SHOCK WAVES IN GAS-SOLID FLOWS [THEORETISCHE UND EXPERIMENTELLE UNTERSUCHUNGEN VON DRUCK-WELLEN IN GAS-FESTSTOFF-STROEMUNGEN]

Hans-Juergen Deeg 1976 129 p refs In GERMAN

(ILR-18; ISBN-3-7983-0571-4) Avail: NTIS HC A07/MF A01

As part of a liquid metal-magnetohydrodynamic conversion program shock waves in gas-solid flows, consisting of air and glass particles, were investigated theoretically and experimentally. A flow mechanical model for supercritical gas-solid flows was developed. The model was used to investigate the influence of the supercritical flow condition in front of the shock wave and the influence of the particle size on the change of the flow condition within a shock wave. Equipment to generate and measure shock waves in an air-glass particle flow was developed. Theory and experiments were compared and proposals for improvement of the flow model made. ESA

N77-33469# Institut Franco-Allemand de Recherches, St. Louis (France).

CORRELATION ANALYSIS OF FLOW VELOCITY FLUCTUATIONS IN A SUBSONIC FREE JET [KORRELATIONSANALYSE DER SCHWANKUNGEN DER STROEMUNGSGESCHWINDIGKEIT IN EINEM UNTERSCHALL-FREISTRAHL]

H. J. Pfeifer 15 Nov. 1976 26 p refs In GERMAN

(ISL-R-134/76) Avail: NTIS HC A03/MF A01

Cross correlation measurements of velocity fluctuations in a subsonic free jet were carried out using laser anemometry methods. An increase of the normalized convection velocity was found at increasing distance from the nozzle for both selected test conditions. The maximum values of the cross correlation coefficients demonstrate the existence of a coherent structure in the jet, the dimensions of which are comparable to the jet's diameter. ESA

N77-33470# Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France). Dept. d'Aerothermodynamique.

PREDICTION OF ONSET AND DEVELOPMENT OF BOUNDARY LAYER TRANSITION

Roger Michel Paris Assoc. Aeron. et Astronautique de France 1977 23 p refs In FRENCH; ENGLISH summary Presented at the 13th Colloq. d'Aerodyn. Appl., Lyon, 8-10 Nov. 1976

(AAAF-NT-77-03; ISBN-2-7170-0420-3) Avail: NTIS HC A02/MF A01; CEDOCAR, Paris FF 15 (France and EEC) FF 19 (others)

The existing means of prediction of the onset of the boundary layer transition and its development up to the established turbulent regime was analyzed in the field of incompressible or moderately compressible flows. Practical techniques of prediction are reviewed with a discussion of the available empirical criteria and of approximate methods for calculating the boundary layer, starting from a given beginning of transition. Special attention is paid to recent methods of prediction, using transport equations to describe the development of the turbulence in the boundary layer during transition. Different examples of application show that this is a technique which really permits a reasonable prediction of the onset and development of transition, in good agreement with experiments. Author (ESA)

N77-33471# Poitiers Univ. (France). Centre d'Etudes Aerodynamiques et Thermiques.

EXPLORATORY STUDY OF TURBULENCE IN AIR INTAKES [ETUDE EXPLORATOIRE DE LA TURBULENCE DANS LES PRISES D'AIR]

J. F. Arnaudon and L. F. Tsen Paris Assoc. Aeron. et Astronautique de France 1977 36 p refs In FRENCH Presented at the 13th Colloq. d'Aerodyn. Appl., Lyon, 8-10 Nov. 1976

(Contract DRME-76/1047)

(AAAF-NT-77-17; ISBN-2-7170-0434-3) Avail: NTIS

HC A03/MF A01; CEDOCAR, Paris FF 25 (France and EEC) FF 29 (others)

An experimental study of circular and rectangular air intakes is presented. Pressure distribution and mean velocity distributions were obtained with an input air velocity of 12 m/s and turbulence of 3.5 %. Flux measurements together with rms distribution of the longitudinal velocity component were derived and a spectrum analysis of the longitudinal velocity component is presented. All studies were performed in incompressible flow regime with pitot tubes and hot air anemometers. The aim was to collect basic data for large scale modelization of turbulent flow in bi- and tri-dimensional air intakes. ESA

N77-33472# Aix-Marseilles Univ. (France). Inst. de Mecanique Statistique/de la Turbulence.

RATIO BETWEEN DYNAMICAL AND THERMAL DISSIPATION IN TURBULENT FLOWS [RAPPORT DES DISSIPATIONS DYNAMIQUE ET THERMIQUE DANS DES ECOULEMENTS TURBULENTS]

I. Dekeyser, C. Beguier (CNRS, Marseille), and B. E. Launder (Calif. Univ., Davis) Paris Assoc. Aeron. et Astronautique de France 1977 20 p refs In FRENCH Presented at the 13th Colloq. d'Aerodyn. Appl., Lyon, 8-10 Nov. 1976

(AAAF-NT-77-21; ISBN-2-7170-0438-6) Avail: NTIS HC A02/MF A01; CEDOCAR, Paris FF 15 (France and EEC) FF 19 (others)

Various expressions of the non-dimensional ratio between the dynamical and thermal dissipation in turbulent flow are given and criticized. A correlation with experiment was attempted in the case of wall and free turbulent flows. The overall value of the ratio was found to remain near 0.5 if the hypothesis of small scale isotropy is taken into account. ESA

N77-33473# Centre d'Etudes Aerodynamiques et Thermiques, Poitiers (France).

TURBULENCE MEASUREMENTS BY LASER ANEMOMETRY [MESURES DE TURBULENCE PAR ANEMOMETRIE LASER]

P. Ardonceau Paris Assoc. Aeron. et Astronautique de France Oct. 1976 35 p refs In FRENCH Presented at the 13th Colloq. d'Aerodyn. Appl., Lyon, 8-10 Nov. 1976

(Contract DRME-74/632; DRME-76/1047)

(AAAF-NT-77-07; ISBN-2-7170-0424-6) Avail: NTIS HC A03/MF A01; CEDOCAR, Paris FF 25 (France and EEC) FF 29 (others)

Various techniques used for laser anemometry are reviewed. The components of the CEAT chain are detailed with regard to operational use and associated precautions needed for reliable results. Application to a turbulent supersonic compressible flow and reattached transonic flow is discussed. ESA

N77-33474# Lyon Univ. (France). Lab. de Mecanique des Fluides.

STRUCTURE OF A TURBULENT BOUNDARY LAYER IN LONGITUDINAL EQUILIBRIUM IN A POSITIVE PRESSURE GRADIENT [STRUCTURE D'UNE COUCHE LIMITE TURBULENTE EN EQUILIBRE LONGITUDINAL DANS UN GRADIENT DE PRESSION POSITIF]

G. Charnay and F. Bario Paris Assoc. Aeron. et Astronautique de France 1977 39 p refs In FRENCH Presented at the 13th Colloq. d'Aerodyn. Appl., Lyon, 8-10 Nov. 1976

(AAAF-NT-77-18; ISBN-2-7170-0435-I) Avail: NTIS HC A03/MF A01; CEDOCAR, Paris FF 25 (France and EEC) FF 29 (others)

A new variable pressure gradient wind tunnel is described with regard to the main and secondary aspirating circuits and calibrating procedures for flow velocities up to 30 m/s. The experimental conditions required to achieve a bidimensional boundary layer are reviewed and the measuring techniques are detailed. Results are discussed for the cases of mean velocities and global characteristics as well as for the turbulent field with emphasis on local balance of the turbulent kinetic energy. ESA

N77-33475# European Space Agency, Paris (France).

EFFECT OF FREE STREAM TURBULENCE ON TURBULENT BOUNDARY LAYERS IN INCOMPRESSIBLE FLOW

Daniel Arnal Sep. 1977 131 p refs Transl. into ENGLISH of 'Influence de la Turbulence de l'Ecoulement Gen. sur les Couches Limites Turbulentes en Fluide Incompressible', ONERA, Paris Report ONERA-NT-1977-1, 1977 Original report in FRENCH previously announced as N77-30428

(ESA-TT-411; ONERA-NT-1977-1) Avail: NTIS HC A07/MF A01

The influence of a free stream turbulence on a turbulent boundary layer subjected to a positive pressure gradient was studied. A high level of turbulence was generated by a grid of rods. Measurements of the mean velocity and of the fluctuations in the boundary layer are presented. The longitudinal velocity fluctuation is characterized by its mean quadratic value and by its spectrum. The influence of the free stream turbulence seems to be restricted to the external region of the boundary layer. The most important effects are obtained around the separation point. Calculations of the boundary layer by means of a set of transport equations are compared with the present experiments and other available data. An integral method is also proposed, in which an adapted mixing length scheme is used. Both calculation methods give a good level of agreement with experiments. Author (ESA)

N77-33476# Notre Dame Univ., Ind. Dept. of Aerospace and Mechanical Engineering.

UNDSAFE-I: A COMPUTER CODE FOR BUOYANT FLOW IN AN ENCLOSURE

K. T. Yang and L. C. Chang 1 Mar. 1977 106 p refs

(Grants NBS-G-7-9002; NSF GI-37191; NSF ATA-07749-A01; NSF AEN-07749-A02)

(PB-267278/0; TR-79002-77-1; NBS-GCR-77-84) Avail: NTIS HC A06/MF A01 CSCL 13L

A description is given of a numerical computer code known as UNDSAFE-1 for predicting the flow, temperature and pressure fields in a simple two-dimensional rectangular enclosure due to a volumetric heat source. It accommodates either a doorway or a window, and a variety of conditions such as location, extent and strength of the heat source as well as various thermal boundary conditions along the ceiling and the floor of the enclosure. Physical effects taken into account in this code include strong buoyancy, compressibility, and turbulence. The code is fully documented and explained in this report in terms of input data and format as well as available output options. A complete numerical example is presented. GRA

N77-33477# Iowa Inst. of Hydraulic Research, Iowa City.

HEAT TRANSFER ANALYSIS FOR UNSTEADY HIGH VELOCITY PIPE FLOW Final Report, Jan. - Jun. 1976

Ching Jen Chen, Peter Li, Jenq Shinq Chiou, and Hsai Yin Lee Apr. 1977 128 p refs

(Grant DAAG29-76-G-0123)

(AD-A041547; RIA-R-CR-77-019) Avail: NTIS HC A07/MF A01 CSCL 20/13

This report consists of three parts. The first is the analysis for minimization of the temperature distortion due to the thermocouple cavity. The error is minimized or reduced to zero by optimizing the combination of cavity diameter and depth and the thermocouple transport properties and size. The second is the refinement of the presently available computer program for prediction of the surface temperature and heat flux at the inner surface of the pipe by inverting the temperature response measured by an interior probe close to the heated surface. The refinement is achieved by using the double precision format in the program and adapting the dimensionless formulation. The third is to study the inversion solution for a large time duration of a time dependent surface heat flux. The solution is obtained by the method of Laplace transformation with the convolution integral. Author (GRA)

N77-33478# Advisory Group for Aerospace Research and Development, Paris (France).

PHYSICAL VULNERABILITY OF AIRCRAFT DUE TO FLUID DYNAMIC EFFECTS

D. B. Ankeney (Naval Weapons Center, China Lake, Calif.) Jul. 1977 80 p refs

(AGARD-AR-106) Avail: NTIS HC A05/MF A01

The problem of predicting the structural response to external blast was summarized. Important details of a spherical charge in free air as it interacts with rigid surfaces were studied. The use of impulse momentum for calculating structural response

and the approximation of a uniformly distributed impulse on the surface in question are approximations and are experimentally justified. Author

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N77-33479*# Shaker Research Corp., Ballston Lake, N. Y.
UNDERGROUND COAL MINE INSTRUMENTATION AND TEST Final Report
R. F. Burchill and W. D. Waldron [1976] 129 p refs
(Contract NAS8-31668)
(NASA-CR-150045) Avail: NTIS HC A07/MF A01 CSCL 14B

The need to evaluate mechanical performance of mine tools and to obtain test performance data from candidate systems dictate that an engineering data recording system be built. Because of the wide range of test parameters which would be evaluated, a general purpose data gathering system was designed and assembled to permit maximum versatility. A primary objective of this program was to provide a specific operating evaluation of a longwall mining machine vibration response under normal operating conditions. A number of mines were visited and a candidate for test evaluation was selected, based upon management cooperation, machine suitability, and mine conditions. Actual mine testing took place in a West Virginia mine. Author

N77-33480# Weapons Research Establishment, Adelaide (Australia).
AN ACCURATE ANGULAR POSITION AND ANGULAR VELOCITY INSTRUMENT BASED ON AN OPTICAL INCREMENTAL ENCODER
B. Humski Dec. 1976 35 p refs
(WRE-TN-1730(WR/D)) Avail: NTIS HC A03/MF A01

An instrument designed to measure the instantaneous angular position and angular velocity of a freely rotating wind tunnel model is described. The transducer, based on a photo-optical incremental encoder, is insensitive to vibrations. Although primarily intended for studying the roll behaviour of a wind tunnel model, its high resolution, instantaneous response to roll reversal, freedom from accummulated errors and error detection capabilities make it suitable for general purpose usage in a wide range of applications. Author

N77-33481*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
SCATTEROMETER RECEIVER DYNAMIC RANGE/LINEARITY
W. A. Rosenkranz Jun. 1975 74 p refs
(Contract NAS9-12200)
(NASA-CR-151526; LEC-6107) Avail: NTIS HC A04/MF A01 CSCL 14B

Results of an investigation aimed at determining the dynamic range and linearity of the S-193 scatterometer receiver from data acquired during Skylab missions 2 and 3 are summarized. Author

N77-33482*# South Dakota School of Mines and Technology, Rapid City. Dept. of Electrical Engineering.
THIN FILM ATOMIC HYDROGEN DETECTORS Final Report
C. L. Gruber Jun. 1977 33 p refs
(Contract NAS5-23470)
(NASA-CR-152605) Avail: NTIS HC A03/MF A01 CSCL 14B

Thin film and bead thermistor atomic surface recombination hydrogen detectors were investigated both experimentally and theoretically. Devices were constructed on a thin Mylar film substrate. Using suitable Wheatstone bridge techniques sensitivities of 80 microvolts/2x10 to the 13th power atoms/sec are attainable with response time constants on the order of 5 seconds. Author

N77-33483*# Boeing Aerospace Co., Seattle, Wash.
DEVELOPMENT OF A HIGH TEMPERATURE CAPACITIVE PRESSURE TRANSDUCER
Richard L. Egger Oct. 1977 120 p refs
(Contract NAS3-19556)
(NASA-CR-135282; D180-20746-1) Avail: NTIS HC A06/MF A01 CSCL 14B

High temperature pressure transducers capable of continuous operation while exposed to 650 C were developed and evaluated over a full-scale differential pressure range of + or - 69 kPa. The design of the pressure transducers was based on the use of a diaphragm to respond to pressure, variable capacitive elements arranged to operate as a differential capacitor to measure diaphragm response and on the use of fused silica for the diaphragm and its supporting assembly. The uncertainty associated with measuring + or - 69 kPa pressures between 20C and 650C was less than + or - 6%. Author

N77-33484# Northwestern Univ., Evanston, Ill. Dept. of Material Science.
GEOMETRICAL PROBLEMS WITH A POSITION SENSITIVE DETECTOR EMPLOYED ON A DIFFRACTOMETER: ITS USE IN THE MEASUREMENT OF STRESS
M. R. James and J. B. Cohen 15 Jun. 1977 33 p refs
(Contract N00014-75-C-0580)
(AD-A041102; TR-18) Avail: NTIS HC A03/MF A01 CSCL 14/2

Defocussing errors associated with the use of a straight one dimensional position sensitive detector on a diffractometer are examined. Over a 10 deg. of 2 theta angular range the error is 0.02 deg. of 2 theta at worst. Author (GRA)

N77-33485# Ampex Corp., Redwood City, Calif.
HIGH BIT RATE DIGITAL RECORDER Final Technical Report, Jun. 1975 - Jun. 1976
Charles F. Spitzer and Ted A. Jensen Jun. 1977 80 p refs
(Contract F30602-75-C-0246; AF Proj. 4027)
(AD-A041320; EP-7357; RADC-TR-77-31) Avail: NTIS HC A05/MF A01 CSCL 14/3

This report is the final report on a study program to demonstrate feasibility of recording and reproducing 240 Mb/sec digital data using magnetic tape. A transport employing two-inch wide tape and 64 track longitudinal recording heads was utilized as a feasibility model. The system included necessary electronics for operation on any 6 tracks on tape including all analog electronics, bit synchronizers, M(2) Encoders and Decoders, deskew electronics and the necessary multiplexers and demultiplexers. A bit packing density of 30 Kb/in/track was used and an over all raw bit error rate, without error detection and correction, and including all tape dropouts, of roughly 0.000003 was achieved. Author (GRA)

N77-33486# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
THE THEORY OF DIFFRACTION FROM A HOLOGRAPHIC LENS Ph.D. Thesis. Final Report
Daniel D. Young May 1977 210 p refs
(AD-A041537; AFIT/DS/PH/76-4; AFAL-TR-76-270) Avail: NTIS HC A10/MF A01 CSCL 20/6

The objective of this effort was to apply diffraction theory to calculate the diffraction efficiency of a holographic lens in terms of the original geometry, exposure conditions, material parameter, processing effects, and reconstruction geometry. The analysis was based upon a pair of coupled wave equations with variable coefficients of sufficient generality to permit the determination of the diffraction efficiency in cases where previous theories have been limited. These cases include: spherical object, reference, and reconstruction waves; polarized reconstruction waves; reconstruction wave vectors out of the plane of incidence of the construction wave vectors; thickness changes of the hologram recording material due to processing; gross changes in optical index to processing; variations with position inside the hologram of the hologram parameters such as optical index,

index modulation; saturation of the index and a absorptance modulation with exposure; and absorption during exposure of the construction waves. The JWKB approximation is used to solve the coupled wave equations with variable coefficients which describe the diffraction process. The boundary conditions for both a transmission and reflection hologram were applied to obtain particular solutions. A closed form solution was obtained for the case of a transmission hologram by the trapezoidal approximation. Good agreement was obtained between the experimentally measured diffraction efficiency and the theoretically calculated diffraction efficiency. GRA

N77-33487# Defence Research Establishment Pacific, Victoria (British Columbia).

AN INTERFACE UNIT TO LINK A REAL-TIME ANALYZER WITH AN INCREMENTAL RECORDER (FIELD OPERATION AND SERVICE MANUAL)

R. C. Weir Feb. 1977 40 p refs

(AD-A042130; DREP-TM-77-2) Avail: NTIS MF A01 CSCL 14/3

A DREP-designed Interface Unit is described that links a PEC Incremental Tape Transport with a GR 1921 Real-Time Analyzer. The Interface Unit supplies the timing and control for the system. Four sets of signals are sampled periodically, and the resulting tape record is later used with a Sigma-7 computer to yield plots of dB level versus frequency. Author (GRA)

N77-33488# Army Missile Research and Development Command, Redstone Arsenal, Ala. Guidance and Control Directorate.

ASSESSMENT OF A DYNAMICAL GYROSCOPE MODEL UTILIZING DIGITAL SIMULATION TECHNIQUES

Larry R. Murdock 3 Jun. 1977 275 p

(AD-A042497; DRDMI-T6-77-18) Avail: NTIS HC A12/MF A01 CSCL 17/7

This report presents an assessment and performance of a dynamical gyroscope modelled for a six-degree-of-freedom digital missile trajectory simulation. Mathematical models and digital simulation results of an idealized gyro model and the dynamical (realistic) model are given. The computer program listings are presented in the appendices. Author (GRA)

N77-33489# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.

FEASIBILITY STUDY OF THERMOCOUPLE CORRELATION TYPE TRANSIT TIME FLOWMETER IN TRANSIENT STEAM-WATER FLOW

Gordon D. Lassahn Mar. 1977 71 p refs

(Contract EY-76-C-07-1570)

(TREE-NUREG-1011; NRC-2) Avail: NTIS HC A04/MF A01

Low-flow, air-water tests; low-flow, hot-water tests; and steam-water blowdown tests were performed to determine the feasibility of using a thermocouple correlation transit time flowmeter for fluid velocity measurements during Loss-of-Fluid Test blowdown experiments. The results indicate that this type of flowmeter works well in the steady flow conditions tested. However, the system does not work in transient flow experiments in which the averaging time is limited to 1 second, because thermocouple signals do not have enough high frequency content to keep the statistical noise of the correlation process down to a reasonable level. ERA

N77-33490# Institut Franco-Allemand de Recherches, St. Louis (France).

METHOD FOR THE RAPID TEMPERATURE MEASUREMENT OF SILVER SURFACES [METHODE ZUR SCHNELLEN TEMPERATURMESSUNG AN SILBEROBERFLAECHEN]

H. Mach, U. Werner, H. Masur, and P. Coquerelle 9 Jun. 1976 25 p refs In GERMAN

(ISL-R-115/76) Avail: NTIS HC A03/MF A01

A method for the rapid temperature measurement in the range 0 to 600 C of silver surfaces at wavelengths around 320 nm was developed. Time resolution in the microsecond range and spatial resolution in the square millimeter range were shown to be possible. Advantages and disadvantages of the method are discussed. Examples of rapid heating during capacitor discharge and during carbon dioxide laser irradiation are given. ESA

N77-33491# Institut Franco-Allemand de Recherches, St. Louis (France).

TEMPERATURE MEASUREMENT OF A CUTTING TORCH FLAME CONTAINING TiO2- AND SiO2-PARTICLES [TEMPERATURMESSUNGEN AN EINER TiO2- UND SiO2-TEILCHEN ENTHALTENDEN SCHNEIDBRENNERFLAMME]

H. Mach 6 Aug. 1976 28 p refs In GERMAN

(ISL-R-123/76) Avail: NTIS HC A03/MF A01

A cutting torch flame, consisting of a cold oxygen inner zone and a hot outer zone, containing TiO2 and SiO2 particles with relatively high concentration, was investigated spectroscopically. Cross section profiles of the spectral radiation density and the optical thickness of the flame were measured photographically. The cross section profiles were converted into radial profiles of the emission and absorption coefficients using Abel inversion. From these flame temperature profiles at various distances of the burner nozzle were obtained. Near the nozzle, inner and outer flame temperatures of appr. 1300 and 1700 K were found, whereas in the upper part of the flame, temperatures of appr. 1400 and 1500 K were found. ESA

N77-33492# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Physik der Atmosphaere.

DEVELOPMENT AND CONSTRUCTION OF THE SMALL DATA ACQUISITION SYSTEM MINIDIG [ENTWICKLUNG UND BAU DER KLEINEN DATENERFASSUNGSANLAGE MINIDIG]

R. Schellhase 16 Nov. 1976 19 p refs In GERMAN; ENGLISH summary

(DLR-IB-553-76/6) Avail: NTIS HC A02/MF A01

A small, light data acquisition system of low power dissipation for use on the ASK 16 motor gliders was developed. It covers 16 control points with a rate of maximum 100 Hz and registers the values digitally - 12 bit/word - on tape cartridge 3 M - TYP DC 300A. The cartridge has a capacity of appr. 1 million measuring values. This results in a recording period of about 2 hours at a rate of 10 Hz. For the subsequently treated data, a play back unit was developed which records the cartridge data on computer tape. A number of additional programs are available for further handling of these cartridges. Author (ESA)

N77-33493# Institut Franco-Allemand de Recherches, St. Louis (France).

LASER INTERFERENCE MICROPHONE FOR ULTRASONIC RECORDINGS AND NONLINEAR ACOUSTIC INVESTIGATIONS [LASER-INTERFERENZ-MIKROFON FUER ULTRASCHALLREGISTRIERUNGEN UND UNTERSUCHUNGEN DER NICHTLINEAREN AKUSTIK]

G. Smeets and A. George 4 Nov. 1976 19 p refs In GERMAN

(ISL-R-132/76) Avail: NTIS HC A02/MF A01

A laser beam was split in a Mach-Zehnder arrangement. One of the beams was exposed (unscreened) to the high frequency acoustic field to be recorded. The interferometer was steadily maintained on the flank of an interference fringe by using a phase servosystem. The optical microphone allowed recording, without delay, of the real pressure variation of an acoustic field with a time resolution better than 1 microsecond, and produces only a small disturbance in the field. The operation of the microphone is described for a number of examples. ESA

N77-33494# Institut Franco-Allemand de Recherches, St. Louis (France).

PROCESSING OF PHOTOGRAPHICAL DATA FOR ANALYSIS OF TARGET DEFORMATION IN TERMINAL BALLISTICS EXPERIMENTS [DEPOUILLEMENT D'ENREGISTREMENTS PHOTOGRAPHIQUES EN VUE DE L'ANALYSE DE LA DEFORMATION DES CIBLES DANS LES EXPERIENCES DE BALISTIQUE TERMINALE]

H. F. Lehr and G. Weihrauch 14 May 1976 23 p refs In FRENCH Presented at the ANRT Colloq. on 'Metrologie, Anal., Traitement des Images', Paris, 5-6 May 1976

(ISL-CO-201/76) Avail: NTIS HC A02/MF A01

The processing of radiographs, chronophotographs, and classic photographs used for target deformation analysis upon projectile impact is presented. Visualization of the displacements of discrete planes in front of the projectile was performed by examination

through a micrometric microscope on the original picture or semi-automatically on an enlargment using appropriate digitizer devices. The deformations themselves were taken either from thick targets with a posteriori chemical attack or from stacks of parallel thin aluminum foils regularly spaced. A computer program and a plotter system were used to determine the movement of any point of the target material together with the corresponding creep. ESA

N77-33495# Institut Franco-Allemand de Recherches, St. Louis (France).
PHOTOGRAPHIC STUDY OF RAPID EVENTS BY PICOSECOND TECHNIQUES
K. Vollrath and M. Hugenschmidt 13 Sep. 1976 9 p refs Presented at the 12th Congr. on High-Speed Phot., Toronto, 2-6 Aug. 1976
(ISL-CO-214/76) Avail: NTIS HC A02/MF A01

Former studies of high-speed events, e.g., spark formation and laser produced plasmas by nanosec light pulses, revealed the necessity of shorter exposure times. This can be done using picosec light pulses, either a single one or a train of pulses, generated in the cavity of a mode-locked neodymium or a ruby laser. Schlieren photos of laser triggered open-air sparks taken by multiple exposure with a series of pulses from a neodymium laser show the advantages of these techniques compared to one-dimensional streak photographs. As another example, photos of a plasma induced by a series of ps-light-pulses on a metal surface are shown. The application of single-pulse techniques is demonstrated by the study of a laser spark, induced by one or two ps pulses in air. To get sufficient power for a breakdown, the single pulse extracted from the mode-locked laser passes a two-stage ruby amplifier. After focalization, the main part of the pulse energy produces the breakdown. The remaining part of the pulse passes a variable optical delay system and serves as a light source for a schlieren system. In this way, single-shot schlieren photos of laser sparks with life times less than one nanosec are obtained. For the study of later stages in spark development multiple exposure by a train of pulses is used. The above mentioned experimental arrangements are discussed in detail, the measurement of pulse duration by TPF and image converter is described, and some results as regards plasma behavior are presented. Author (ESA)

N77-33496# California State Dept. of Transportation, Sacramento. Transportation Lab.
IMPROVED NUCLEAR GAGE DEVELOPMENT PHASE 1 AND 2 Interim Report
E. L. Chan, F. C. Champion, D. R. Castanon, J. C. Chang, and J. B. Hannon Sep. 1976 227 p refs Sponsored in part by FHWA
(PB-267106/3; CA-DOT-TL-2857-1-76-45; Rept-19202-632857) Avail: NTIS HC A11/MF A01 CSCL 14B

Phase one and two of an investigation covering the design and construction of a prototype nuclear moisture density backscatter gage are presented. Gage development was based upon the analysis of several factors which affect gage performance. Research indicated that the prototype gage measurements are approximately equivalent to measurements obtained by a commercial transmission gage. Research findings indicate that the qualification of the backscatter test method is a valid, reliable, and expedient procedure for determining in-situ soil conditions. GRA

36 LASERS AND MASERS

Includes parametric amplifiers.

N77-33497*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
DEMONSTRATION OF RAPID-SCAN TWO-DIMENSIONAL LASER VELOCIMETRY IN THE LANGLEY VORTEX RESEARCH FACILITY FOR RESEARCH IN AERIAL APPLICATIONS
Luther R. Gartrell and Frank L. Jordan, Jr. Aug. 1977 23 p refs
(NASA-TM-74081) Avail: NTIS HC A02/MF A01 CSCL 20E

Tests were conducted to demonstrate a rapid scan two dimensional laser velocimeter (LV) measurement technique for aerial applications research. The LV system is capable of simultaneously measuring both vertical and axial flow velocity components in a near or far field vortex system. Velocity profiles were successfully measured in the wake vortex of a representative agricultural aircraft model, with the vortex system rapidly transporting in ground effect. Results indicate that the laser velocimetry technique can provide quantitative information of wake vortex characteristics in ground effect. Author

N77-33498*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THE USE OF LIDAR FOR STRATOSPHERIC MEASUREMENTS
M. P. McCormick Sep. 1977 26 p refs Presented at 8th Intern. Laser Radar Conf., Philadelphia, 6-9 Jun. 1977
(NASA-TM-74085) Avail: NTIS HC A03/MF A01 CSCL 20E

Stratospheric measurements possible with ground-based, airborne, and satellite-borne lidar systems are reviewed. The instruments, basic equations, and formats normally used for various scattering and absorption phenomena measurements are presented including a discussion of elastic, resonance, Raman, and fluorescence scattering techniques. Author

N77-33499# Naval Training Equipment Center, Orlando, Fla.
OPTICAL ANALYSIS OF A MULTICOLOR MODEL OF THE 360 DEGREE NONPROGRAMMED VISUAL DISPLAY Interim Report, Nov. - Dec. 1976
Neil Mohon Apr. 1977 30 p refs
(AD-A042092; NAVTRAEQUIPC-IH-282) Avail: NTIS HC A03/MF A01 CSCL 20/5

A preliminary optical analysis is presented of the various problems involved in converting a monochromatic 360 degree nonprogrammed visual display to multicolor. It discusses the lens design, selection of the number and wavelength of appropriate lasers, color separation filters, the spectral response of CCDs, color flicker and frame rate, and color laser speckle. Much technical planning and design is required; but no insurmountable technical difficulties are foreseen. Author (GRA)

N77-33500# Hull Univ. (England). Dept. of Applied Physics.
INTERACTION OF PULSED CO2 AND PULSED HF/DF LASER RADIATION WITH GASEOUS AND SOLID TARGETS Final Scientific Report, 1 Oct. 1973 - 31 Aug. 1976
B. K. Deka, P. E. Dyer, D. J. James, and S. A. Ramsden 1 Feb. 1977 79 p refs
(Grant AF-AFOSR-2610-74)
(AD-A041486; AFOSR-77-0778TR) Avail: NTIS HC A05/MF A01 CSCL 20/5

HF and DF laser radiation from an unstable resonator was used to study laser induced breakdown in air, nitrogen and argon. For air at a pressure of 760 torr a threshold of 6 x 10 to the 10th power watts/sq cm was found for HF radiation induced breakdown. This threshold is proportional to p to the -0.6 power. The breakdown threshold for pure Ar is 1.6 x 10 to the 10th power watts/sq cm at atmospheric pressure and scales to the -0.95 power with pressure. The threshold for DF laser induced breakdown of air was twice the threshold of HF laser induced breakdown. The interaction of carbon targets with pulsed CO2 laser radiation was studied. The pulse width was 5 nanoseconds and the maximum flux density ranged from 4 x 10 to the 10th power to 5 x 10 to the 12th power watts/sq cm. The ion expansion velocity, electron temperature and X-ray emission from the carbon surface were measured. X-ray continuum emission was only detected at the highest flux densities, approximately 10 to the 12th power watts/sq cm, when an effective electron temperature of approximately 1 keV was measured. The laser induced breakdown thresholds for Ar, N2 and CO2 were measured using CO2 laser pulses of length 3 to 40 nanoseconds. In argon the threshold becomes energy dependent for pulse length less than 5 nanoseconds and is power dependent for pulse lengths greater than 14 nanoseconds. A similar transition between energy and power dependence is also exhibited in nitrogen. In a mixture of CO2/N2/He the threshold for laser induced breakdown exhibited a pressure dependence of p to the -0.3 power for 3 nanosecond pulses. GRA

N77-33501# ARO, Inc., Arnold Air Force Station, Tenn.
EPA LASER FLAME ANALYZER SYSTEM Final Report, 1 Jul. 1973 - 8 Feb. 1976
H. T. Bentley, III and B. W. Bomar Jun. 1977 57 p refs
(AD-A041216; ARO-OMD-TR-76-78) Avail: NTIS HC A04/MF A01 CSCL 20/5

An electro-optical laser flame analyzer system specifically designed for EPA applications is described. Preliminary studies to establish design criteria included 1) studies of radiation levels at a number of discrete wavelengths corresponding to common laser wavelengths (that is, HeNe, argon ion, and ruby); 2) determination of fringe quality by means of an imaging system and an acoustically driven probe wire; 3) estimates of particle arrival rates for both oil and gas fired flames; and 4) effect of flame turbulence on LV signals. The EPS laser flame analyzer system consists of a specially adapted two-component laser velocimeter. Provisions were made to include, upon completion of development, both interferometric particle sizing and a third component of velocity. GRA

N77-33502# Aerodyne Research, Inc., Bedford, Mass.
A CW HF LASER WITH SUPERSONIC PREMIXING AND STATIONARY SHOCK INITIATION Final Report, 1 Jun. 1975 - 31 Dec. 1976
James P. Moran and Charles E. Kolb Apr. 1977 62 p refs
(Contract N00014-75-C-1123; DARPA Order 3012)
(AD-A041779; ARI-RR-105) Avail: NTIS HC A04/MF A01 CSCL 20/5

Formation of HF by the chain reaction is initiated by the simultaneous reaction NO - F2 yields NOF - F. A detonable mixture of the reactants, H2, F2, and NO in argon or helium diluent, is achieved by secondary injection of H2 and NO along the trailing edges of a two-dimensional nozzle array into a cold supersonic stream of premixed F2 plus diluent. Mixing of the secondary injectants is achieved without significant chemical reactions in the slightly divergent supersonic mixing section. The resultant detonable mixture is directed into a chamber as a slightly underexpanded free jet. This free jet is interrupted shortly downstream of its exit plane by a nearly normal shock wave. The shock is held in a stationary manner by a shock holder which accepts only a portion (approximately 70%) of the total jet flow. An adjustable sonic throat, within the shock holder, controls the accepted fraction. Laser mirrors in a fixed stable-cavity configuration constitute two walls of the shock holder. Maximum laser cavity intensity, sampled through several small holes in one mirror, presently appears to be in excess of 51 w/sq cm, as deduced from measurements of power in excess of 117 mw incident on a PbSe detector. Laser power output in excess of 20w, in a closed cavity configuration, was determined from local mirror heating by thermocouple measurements. This work represents the first success in achieving a stationary shock in a detonable mixture in a configuration other than a free jet. Furthermore, it represents the first demonstration of CW laser operation across a stationary shock. Author (GRA)

N77-33503# Army Electronics Command, Fort Monmouth, N. J.
SOLID-STATE LASER WAVELENGTH IDENTIFICATION USING A REFERENCE ABSORBER
Kenneth O. White, Wendell R. Watkins, Stuart A. Schleusener, and Ronald L. Johnson Jun. 1977 26 p refs
(AD-A041689; ECOM-5820) Avail: NTIS HC A03/MF A01 CSCL 20/5

A Fabry-Perot etalon is used to identify the relative wavelengths of individual spikes in the long-pulse output of a homogeneously broadened, solid-state laser. This identification is accomplished by positioning one side of a low finesse etalon bandpass such that it is coincident with the laser output. Different wavelength spikes experience different attenuations on passing through the etalon, thus enabling a relative wavelength determination from the etalon transmission value. The etalon is incorporated into a real-time minicomputer controlled measuring system capable of storing, analyzing, and displaying various parameters encountered in laser interaction studies. By utilizing the narrow spectral width of individual laser spikes (- 0.0001 nm) and the large number of different wavelength, spikes available in a single long pulse (tens to hundreds), many high-resolution spectral data points can be obtained within the period of one laser shot (- 4 ms). Experimental results of the transmission of erbium: YAG laser radiation in a methane-enriched atmosphere are shown to illustrate one use for the system. This technique provides an accurate means of studying the interaction and propagation nature of certain solid-state lasers used by the Army. The causes of degradation in Army laser systems may be studied with a higher degree of precision, thereby allowing possible minimization or elimination of any such effects. Author (GRA)

N77-33504# Army Armament Command, Rock Island, Ill. Systems Analysis Directorate.
DESCRIPTION OF LASER SPOT MOTION DURING DESIGNATION OF MOVING TARGETS Final Report
George J. Schlenker Jun. 1977 88 p
(AD-A041634; DRSAR/SA/R-23) Avail: NTIS HC A05/MF A01 CSCL 17/8

This report identifies and discusses two distinct dynamic components in a mathematical model of the stochastic motion of a laser spot on a moving target as viewed from the position of the designator. One of these components is contributed by manual tracking and possesses approximately second-order dynamics. The other component is contributed jointly by laser device and atmospheric propagation effects (scintillation) and exhibits nearly first-order dynamics. Both frequency-domain and time-domain analyses are pursued in comparing the mathematical model with a sample of spot motion test data. Algorithms for digital implementation of the components of the stochastic model are derived. The implementation is conceived as an input generator for a laser target signature model. There is an exposition of certain distortions which are produced in the autospectra of the stochastic components due to the implementation. Additionally, some statistical aspects of parameter estimation are presented. Author (GRA)

N77-33505# Naval Postgraduate School, Monterey, Calif.
A HYDROGEN FLUORIDE/DEUTERIUM FLOURIDE LASER AT THE NAVAL POSTGRADUATE SCHOOL M.S. Thesis
William Ted Funk Jun. 1977 92 p refs
(AD-A042341) Avail: NTIS HC A05/MF A01 CSCL 20/5

A small scale hydrogen fluoride (HF) or deuterium fluoride (DF) laser was constructed for the Atmospheric Optical Propagation Program at the Naval Postgraduate School. The laser, with almost forty individually selectable wavelengths between 2.5 and 4.1 micrometers, will prove to be a valuable instrument for the continued studies of laser propagation. In the HF mode, a multiline power out of seven watts was acheived with a confocal cavity arrangement. In the single-line HF mode, fifteen separate wavelengths were distinguished. Three watts of multiline power was achieved in the DF mode while eighteen separate single-line wavelengths were obtained including 160 milliwatts at 3.8007 micrometers, the P2(8) transition. This wavelength is of particular interest to the Navy because of its excellent propagation characteristics in the marine boundary layer. Author (GRA)

N77-33506# Army Missile Research and Development Command, Redstone Arsenal, Ala. Physical Sciences Directorate.
SURFACE DETAIL AND BACKSCATTER FROM COHERENTLY ILLUMINATED TARGETS ROTATING ABOUT THE AXIS OF SYMMETRY
J. Lynn Smith 1 Feb. 1977 44 p
(AD-A042349; DRDMI-TR-77-3) Avail: NTIS HC A03/MF A01 CSCL 17/8

A theoretical analysis of the ratio of rms backscattered intensity fluctuation to average intensity for a coherently illuminated target rotating about an axis of symmetry is presented in this report. The ratio delta I sub rms/-I= depends on the rms random phase fluctuation and the number of decorrelation area cells on the exposed target surface. For the case where the random phase fluctuations are due to surface roughness, the ratio depends on the equivalent surface detail parameters: (1) rms height fluctuation and (2) the product of average roughness slope and the square root of the exposed target surface. The ratio delta I sub rms/-I= is also dependent on the illumination wavelength, and the two surface detail parameters can be uniquely determined if the wavelength dependence of the ratio is measured. The analysis presented is especially relevant to laser radar applications. Author (GRA)

N77-33507# Ohio State Univ., Columbus. Electroscience Lab.

STIMULATED RAMAN SCATTERING IN METHANE WITH Nd YAG PUMP Final Report

J. G. Meadors and M. A. Poirier Jun. 1977 28 p refs
(Grants DAAG29-76-G-0140; DAAG29-74-G-0098)
(AD-A042391; ESL-4297-1) Avail: NTIS HC A03/MF A01 CSCL 20/6

The results of an experimental study of stimulated Raman scattering in methane pumped by a repetitively Q-switched Nd:YAG laser are presented and discussed. Three compact geometrical arrangements were investigated: (1) Raman cell external to the laser cavity with focusing and recollimating optics, (2) Raman cell External to cavity with pump beam coupled into a leaky waveguide (pyrex capillary) immersed in high pressure methane, and (3) Raman cell positioned internal to laser cavity. In configurations (1) and (2), photon conversion efficiencies from 1.06 micrometers to 1.54 micrometers of 15% to 20% were observed with good amplitude stability if proper attention is given to laser adjustment. These results are based on direct measurements of the various signals; pump depletion measurements can not be used to infer energy conversion from pump to Stokes unless care is taken to eliminate pump backscatter. Configuration (3) produced 6.8 millijoule Stokes pulses of 8 nanosecond total width between half power points with remarkable amplitude and shape stability. With careful engineering this basic configuration would be feasible for designing a 1.54 micrometers rangefinder or illuminator. GRA

N77-33508# Army Missile Research and Development Command, Redstone Arsenal, Ala. Army High Energy Laser Directorate.

MEDIUM HOMOGENEITY IN A CHEMICAL LASER CAVITY USING A LATERAL SHEARING INTERFEROMETER

R. William Jones and W. Lavaughn Hales Jan. 1976 29 p refs
(AD-A042504; RH-76-7) Avail: NTIS HC A03/MF A01 CSCL 20/9

This report is a study of recent chemical laser tests which incorporated a real-time flow visualization diagnostic for observing flow field conditions in the chemical laser cavity. Of particular interest in this study is the use of a holographically constructed lateral shearing interferometer to calculate refractive index variations in the flow. GRA

N77-33509# Sperry Univac, St. Paul, Minn. Physics Lab.

MAGNETO-OPTIC DEVELOPMENT FOR LASER BEAM STEERING

T. R. Johansen, F. G. Hewitt, and J. Krawczak May 1977 63 p refs
(Contract F33615-75-C-1099)
(AD-A042985; AFAL-TR-76-230) Avail: NTIS HC A04/MF A01 CSCL 20/5

Strain-free bismuth-substituted rare earth iron garnet crystals grown by liquid phase epitaxy on gadolinium gallium garnet where sodium oxide or lead oxide was added to the bismuth oxide solvent melt. The characterization of the crystals shows that they are well suited for laser beam steering especially at 1.06 micron wavelength. The cause of beam divergence which limits the number of resolvable spots in the crystals grown was identified. The Faraday rotation of the crack-free crystals is as large as expected; the largest measured 6328 A, specific rotation was over 25,000 deg/cm. The magnetic properties of the bismuth garnet crystals are ideal for stripe domain formation. The high magnetization 1000 to 1800 gauss, and the low normal anisotropy, approximately 650 to 100 Oc are well suited to low drive power steering devices. Author

N77-33510# Oak Ridge Y-12 Plant, Tenn. Standards and Surveys Dept.

APPLICATIONS OF THE DIMENSIONAL-MEASURING LASER INTERFEROMETER IN THE OAK RIDGE Y-12 PLANT GAGE LABORATORY

B. M. Burrus Mar. 1977 32 p refs
(Contract W-7405-eng-26)
(Y-2070) Avail: NTIS HC A03/MF A01

The operating principles of the dimensional-measuring laser interferometer are described and photographs and illustrations, of the use of a portable laser interferometer in calibrating dimensional standards and measuring equipment in the Oak Ridge Y-12 Plant Gage Laboratory are given. ERA

N77-33511# Sandia Labs., Albuquerque, N. Mex.

ALIGNMENT TECHNIQUE FOR LOCATING THE REFLECTED SIGNAL OF AN INFRARED LASER OFF A REMOTE TARGET

A. E. McCarthy Mar. 1977 7 p
(Contract EY-76-C-04-0789)
(SAND-76-0671) Avail: NTIS HC A02/MF A01

A technique for locating the signal reflected from a mirror located some distance from a pulsed infrared (IR) laser is described. The technique utilizes a visible He-Ne laser which is mechanically and optically positioned so that its output beam is colinear with the IR laser beam. ERA

N77-33512# Stanford Research Inst., Menlo Park, Calif. Molecular Physics Center.

FIELD IONIZATION FOR LASER ISOTOPE SEPARATION Final Report

T. F. Gallagher, R. M. Hill, and S. A. Edelstein Dec. 1976 70 p refs
(EPRI Proj. 506-3)
(EPRI-NP-334) Avail: NTIS HC A04/MF A01

Research into an aspect of the uranium fuel cycle, the separation of the fissionable U235 fuel from the more abundant, stable U238 is discussed. It was demonstrated by laboratory experiments that, by using electric field ionization of atoms excited by lasers, the efficiency of atomic laser isotope separation can be improved a thousandfold over the direct photoionization method. Both atomic and molecular laser isotope separation processes are reviewed. Technical journal articles which further describe the work and its implications are provided. ERA

N77-33513# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Physik der Atmosphaere.

MISSION DEFINITION FOR THE FIRST FLIGHT OF A MULTIDISCIPLINARY LIDAR SYSTEM FORMULATED FOLLOWING DISCUSSIONS WITH REPRESENTATIVES OF VARIOUS INSTITUTES [MISSIONSDEFINITION FUER ERSTE FLUGZEUGEINSAETZE EINES MULTIDISZIPLINAEREN LIDAR-SYSTEMS FORMULIERT AUF GRUND VON DISKUSSIONEN MIT VERTRETERN VERSCHIEDENER INSTITUTIONEN]

W. Renger and G. H. Ruppersberg Aug. 1976 24 p refs In GERMAN
(DLR-IB-553-76/4) Avail: NTIS HC A02/MF A01

Some aircraft experiments for the remote sensing of the atmosphere with lidar systems were defined in the context of the Spacelab program. The experiments are compatible with corresponding Spacelab experiments. A combined aerosol and differential absorptions lidar will be used in flights over Germany with the meteorological research aircraft Fan-Jet Falcon E for three-dimensional measurements of vapor bubbles, detection of fresh air water courses, penetrating smoke plumes, mass concentration and mass flows, detection of increased contaminant emissions, emission control of various trace gases, comparison with ground values, verification of corresponding simulation models for recommendations for construction planning, and for measures during smog conditions. ESA

N77-33514# Institut Franco-Allemand de Recherches, St. Louis (France).

LASER DYNAMICS AND ROTATIONAL RELAXATION IN CHEMICALLY FORMED CARBON MONOXIDE. PART 2: FURTHER DEVELOPMENT AND OPTIMIZATION OF THE CHEMICAL CO-LASER [LASEREMISSION UND RELAXATIONSPROZESSE IN CHEMISCH ANGEREGTEM KOHLENMONOXID. TEIL 2: WEITERENTWICKLUNG UND OPTIMIERUNG DES CHEMISCHEN CO-LASERS]

K. Daree 22 Dec. 1976 153 p refs In GERMAN
(ISL-R-137/76) Avail: NTIS HC A08/MF A01

The emission of a pulsed chemical CO laser was investigated using numerical calculations and experimental data, and possibilities of increasing the output energy and power are discussed. The effect of pressure, temperature, and mixing ratio

was calculated for the chemical reaction of CS2 and O2. The calculated CO production rate was used in a model, allowing 340 coupled laser transitions, to calculate the output power of the chemical laser. Relaxation processes between molecules in the laser are taken into account, and their influence is discussed. A comparison with spectrally and timely resolved power measurements shows that the model used is suitable for describing the laser system. Conclusions are obtained in regard to the optimal design of high power CO lasers. ESA

N77-33515# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.
CL XI NOZZLE F2 ABSORPTION EXPERIMENT Interim Report
Donald J. Spencer and James A. Beggs 15 Jun. 1977 25 p refs
(Contract F04701-76-C-0077)
(AD-A041566; TR-0077(2607)-1; SAMSO-TR-77-107) Avail: NTIS HC A02/MF A01 CSCL 20/5

An F2-absorption diagnostic technique was developed to determine F2 densities in the flow of a 10.2-cm-long TRW CL XI nozzle. The device was transported to the site, set up, tested, and returned to TRW in two days. Hence, the diagnostic device was demonstrated to be readily transportable and to be operable in a combustion-driven, chemical-laser field environment. Cold- and hot-flow measurements up to 970 K plenum temperature, i.e., no F2 dissociation, were in agreement; therefore, this measurement appears to be reliable. GRA

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N77-33516*# Hetherington (J. S.), Inc., Menlo Park, Calif.
TRANSPARENT MATERIALS PROCESSING SYSTEM Final Report
J. S. Hetherington Aug. 1977 28 p
(Contract NAS8-31417)
(NASA-CR-150411) Avail: NTIS HC A03/MF A01 CSCL 13H

A zero gravity processing furnace system was designed that will allow acquisition of photographic or other visual information while the sample is being processed. A low temperature (30 to 400 C) test model with a flat specimen heated by quartz-halide lamps was constructed. A high temperature (400 to 1000 C) test model heated by resistance heaters, utilizing a cylindrical specimen and optics, was also built. Each of the test models is discussed in detail. Recommendations are given. G.D.H.

N77-33517*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LUBRICATION OF HIGH-SPEED, LARGE BORE TAPERED-ROLLER BEARINGS
R. J. Parker and H. R. Signer (Industrial Tectonics, Inc.) 1977 29 p refs Presented at the Joint Lubrication Conf., Kansas City, 3-5 Oct. 1977; sponsored by ASLE and ASME
(NASA-TM-X-73673; E-8825) Avail: NTIS HC A03/MF A01 CSCL 11I

The performance of 120.65-mm- (4.75-in.-) bore tapered-roller bearings was investigated at shaft speeds up to 15,000 rpm (18,000 DN). Temperature distribution and bearing heat generation were determined as a function of shaft speed, radial and thrust loads, lubricant flow rate, and lubricant inlet temperature. Lubricant was supplied either by jets or by a combination of holes through the cone directly to the cone-rib contact and jets at the roller small-end side. Cone-rib lubrication significantly improved high-speed tapered-roller bearing performance, yielding lower cone-face temperatures and lower power loss and allowing lower lubricant flow rates for a given speed condition. Bearing temperatures increased with increased shaft speed and decreased with increased lubricant flow rate. Bearing power loss increased with increased shaft speed and increased lubricant flow rate. Author

N77-33518*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DESIGN CONSIDERATIONS IN MECHANICAL FACE SEALS FOR IMPROVED PERFORMANCE. 2: LUBRICATION
Lawrence P. Ludwig and Harold F. Greiner (Sealol, Inc.) 1977 20 p refs Presented at Winter Ann. Meeting of ASME, Atlanta, 27 Nov. - 2 Dec. 1977
(NASA-TM-73736; E-9298-2) Avail: NTIS HC A02/MF A01 CSCL 11A

The importance of sealing technology in our industrial, chemical-oriented society in regard to maintenance and environmental contamination is pointed out. It is stated that seal performance (leakage, life) is directly related to seal lubrication. Current thinking in regard to seal lubrication is reviewed; the effect of energy dissipation in the thin lubricating film separating the sealing faces is pointed out, and the results of vaporization due to heating are illustrated. Also, hydrodynamic lubrication is reviewed, and an inherent tendency for the seal to operate with angular misalignment is shown. Recent work on hydrostatic effects is summarized and the conditions for seal instability are discussed. Four different modes of seal lubrication are postulated with the mode type being a strong function of speed and pressure. Author

N77-33519*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
COMPENDIUM OF CRITIQUES OF JPL REPORT SP-43-17: AUTOMOTIVE TECHNOLOGY STATUS AND PROJECTIONS PROJECT
A. Nash Williams 18 Jul. 1977 644 p refs Sponsored by ERDA
(Contract NAS7-100)
(NASA-CR-155180; JPL-Pub-77-40) Avail: NTIS HC A99/MF A01 CSCL 13F

Almost 50 critiques of the Jet Propulsion Laboratory report SP-43-17 are presented together with the JPL responses. Author

N77-33520*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF DOUBLE VACUUM MELTING AND RETAINED AUSTENITE ON ROLLING-ELEMENT FATIGUE LIFE OF AMS 5749 BEARING STEEL
Richard J. Parker and Robert S. Hodder (Latrobe Steel Co., Latrobe, Pa.) Oct. 1977 16 p refs
(NASA-TP-1060; E-9101) Avail: NTIS HC A02/MF A01 CSCL 11F

AMS 5749 steel combines the tempering, hot hardness, and hardness retention characteristics of AISI M-50 steel with the corrosion and oxidation resistance of AISI 440C stainless steel. The five-ball fatigue tester was used to evaluate the rolling-element fatigue life of AMS 5749. Double vacuum melting (vacuum induction melting plus vacuum arc remelting, VIM-VAR) produced AMS 5749 material with a rolling-element fatigue life at least 14 times that of vacuum induction melting alone. The VIM-VAR AMS 5749 steel balls gave lives from 6 to 12 times greater than VIM-VAR AISI M-50 steel balls. The highest level of retained austenite, 14.6 percent, was significantly detrimental to rolling-element fatigue life relative to the intermediate level of 11.1 percent. Author

N77-33521# Washington Univ., Seattle. Dept. of Electrical Engineering.
OPTICAL FIBER CUTTING MACHINE FOR RECTANGULAR AND CIRCULAR FIBERS Annual Report, period ending 31 May 1977
Gordon L. Mitchell and William D. Scott 30 Jun. 1977 28 p
(Contract N00123-76-C-1451)
(AD-A041506) Avail: NTIS HC A03/MF A01 CSCL 13/9

An optical fiber cutting machine for use with rectangular or ground cross section fibers has been developed. It combines a sliding-weight tension apparatus with a diamond knife crack initiation mechanism. Author (GRA)

N77-33522# Southwest Research Inst., San Antonio, Tex.
ANALYSIS OF FILM THICKNESS EFFECT IN SLOW-SPEED LIGHTLY-LOADED ELASTOHYDRODYNAMIC CONTACTS. PART 3: EXPERIMENTAL MEASUREMENT OF LUBRICANT FILM THICKNESS Final Report, 4 Nov. 1975 - 4 Dec. 1976

Feb. 1977 86 p refs
(Contract F33615-76-C-5023)
(AD-A041205; SRI-RS-651; AFML-TR-74-189-Pt-3) Avail: NTIS HC A05/MF A01 CSCL 11/8

This report presents a summary of a program conducted to study experimentally the factors contributing to the formation and maintenance of an adequate elastohydrodynamic oil film thickness in bearings operating in space hardware. Another objective of the study was to investigate the influence of the oil film thickness on bearing-lubricant life expectancy in typical despin mechanical assembly-type bearings operating in vacuum. Results of elastohydrodynamic film thickness measurements for DMA-type bearings operating in vacuum and having various ball-retainer materials as well as different retainer/bearing processing variables are presented and discussed. Also, the effects of frequency and extremes of temperature variation on these bearings are presented. Model studies using an EHD optical tester to perform fully flooded and starved lubrication experiments are also presented and discussed. The results from long-duration tests with DMA-type bearings having ball-piloted retainers and operating in vacuum are also presented. There were no long-term bearing failures and examination of the bearings after test termination reveals that substantially full EHD lubrication (not flooded, but separation of bearing surfaces) at the ball-race contacts apparently prevailed for the duration of the tests. Author (GRA)

N77-33523# Shaker Research Corp., Ballston Lake, N. Y.
FUNDAMENTALS OF GAS LUBRICATION
C. H. T. Pan May 1977 115 p refs
(Contract N00014-74-C-0278)
(AD-A041163; SRC-76-TR-22) Avail: NTIS HC A06/MF A01 CSCL 13/9

Fluid film lubrication is an exceptional mechanical process in that viscous shear stress contributes directly to the useful function of developing a load capacity. Although viscosity also causes bearing friction, the equivalent lift-to-drag ratio of a typical hydrodynamic wedge is in the order of 1000 to 1, which compares favorably to a high performance wing. Lubricant compressibility is the distinctive feature of gas bearings in contrast to the more common liquid lubricated bearings. Although basic concepts such as the hydrodynamic wedge are still applicable to gas bearings despite of lubricant compressibility, many additional features in gas bearings are unique and require separate attention. GRA

N77-33524# Oklahoma State Univ., Stillwater. Fluid Power Research Center.
DEVELOPMENT OF A STABILITY MONITOR/CONTROLLER FOR MATERIAL HANDLING EQUIPMENT. PHASE 2: HARDWARE DEVELOPMENT Final Report, 21 Jun. 1976 - 28 Feb. 1977
Apr. 1977 80 p
(Contract DAAG53-76-C-0144)
(AD-A041192) Avail: NTIS HC A05/MF A01 CSCL 13/5

The purpose of this two-phased study is to investigate the feasibility of developing a stability monitor or controller suitable for material handling equipment (MHE). Recommendations were to be made as to the optimal method (Phase 1). Phase 2 required the design, fabrication, and testing of an exploratory system to demonstrate feasibility. This report documents Phase 1 of the investigation. The exploratory system is a microcomputer-based system which performs calculations as derived in Phase 1. The system hardware is documented. Installation instructions for the exploratory system are provided such that the system can be installed on a vehicle different from the one used in testing. The results of the test program are presented. Author (GRA)

N77-33525# Solar, San Diego, Calif.
DESIGN AND DEVELOPMENT OF A MAJOR ENGINE COMPONENT (COMPRESSOR) FOR A 60 kW TURBINE GENERATOR SET Final Report
Robert Goddard and Douglas J. Martin Jun. 1977 86 p
(Contract DAAK02-73-C-0398)
(AD-A041717; ER-2561) Avail: NTIS HC A05/MF A01 CSCL 21/5

This report documents the design and development of an advanced gas turbine compressor suitable for application to a future military 60-kW turbine-driven generator set. In addition, a gas turbine engine test rig was designed and tested which used the new compressor. The engine test rig confirmed the performance of the new high technology compressor and demonstrated that the innovations incorporated in the test rig make it the basis for a prototype engine which can be developed as a direct replacement for the T-62T-32 engine used in the EMU-30/E generator set. Author (GRA)

N77-33526# Lane Instrument Co., El Cajon, Calif.
DESIGN AND FABRICATION OF TERMINATION BOOTS FOR MECHANICAL/ELECTROMECHANICAL CABLE TERMINATIONS Research and Development Report, FY 1976
N. F. Johnson Nov. 1976 21 p
(Contract N66001-76-M-Y163)
(AD-A041857; NUC-TP-538) Avail: NTIS HC A02/MF A01 CSCL 09/1

This report documents a design study conducted for the Naval Undersea Center by Lane Instrument Company. The study was conducted to develop a design of boots for control of the bending radius at wire rope terminations. This report also provides sufficient data to design and fabricate boots to user requirements. Author (GRA)

N77-33527# Martin Marietta Labs., Baltimore, Md.
ELECTROMECHANICAL MACHINING
K. C. Nielson and J. D. Wilkins (Rock Island Arsenal) Jun. 1977 92 p refs
(Contract DAAA08-75-C-0130)
(AD-A042545; MML-TR-76-23C; AOD-TR-77-001) Avail: NTIS HC A05/MF A01 CSCL 13/8

The purpose of this project was to adapt the Electromechanical Machining (EMM) process to existing in-house machine tools to obtain higher machining rates, and improved tolerances of size, finish, and surface integrity. An engineering and application effort was conducted which was specifically directed towards the transfer of EMM Techniques from the laboratory to manufacturing practice. An electrolyte that inhibits bacterial growth and corrosion, and the auxiliary EMM hardware to be used with a production lathe were developed. A 9% cost reduction was identified in turning AISI 4140 steel with EMM as compared to conventional turning. The new electrolyte, while a major improvement over the old electrolyte, has proven still too corrosive for extended production use. Further development work, primarily in the area of a better non-corrosive electrolyte, will be needed before EMM is ready for production application. Author (GRA)

N77-33528# Aerospace Corp., El Segundo, Calif. Engineering Science Operations.
MEASUREMENT OF SOLID FRICTION PARAMETERS OF BALL BEARINGS
Phil R. Dahl 10 Mar. 1977 25 p refs
(Contract F04701-76-C-0077)
(AD-A042599; TR-0077(2901-03)-3; SAMSO-TR-77-132) Avail: NTIS HC A02/MF A01 CSCL 13/9

The near static friction behavior of ball bearings and other devices can be described by the author's mathematical model of solid friction. Three or more parameters used in the model need to be defined for a particular bearing that may be employed in a motor/load system design. At present, little or no data are available to define these parameters, and there is also little or no information on the subject of test methods for obtaining solid friction model parameter data. This paper presents the results of some tests performed to measure the solid friction parameters of ball bearings. The test method is described, and typical test data are shown. The method of data reduction is based on the analytical quasi-static model and is described in some detail. Friction model parameter results are presented for a 2-1/2 in. OD duplex bearing pair with preloads in the range from 6 to 36 lb. Author (GRA)

N77-33529# Oak Ridge Y-12 Plant, Tenn.
ULTRAPRECISE PARABOLIC INTERPOLATOR FOR NUMERICALLY CONTROLLED MACHINE TOOLS
C. M. Davenport Feb. 1977 86 p refs
(Contract W-7405-eng-26)
(Rept-40004) Avail: NTIS HC A05/MF A01

The mathematical basis for an ultraprecise digital differential analyzer circuit for use as a parabolic interpolator on numerically controlled machines was established, and scaling and other error-reduction techniques were developed. An exact computer model is included, along with typical results showing tracking to within an accuracy of one part per million. ERA

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N77-33530# Texas Technological Univ., Lubbock. Dept. of Industrial Engineering.

A BAYESIAN MODEL FOR DETERMINING THE OPTIMAL TEST STRESS FOR A SINGLE TEST UNIT

H. F. Martz, Jr. and M. S. Waterman (LASL) 31 Mar. 1977 25 p refs Sponsored in part by ERDA

(Contract N00014-75-C-0832)

(AD-A041232; LA-UR-77-664) Avail: NTIS HC A01/MF A01 CSCL 14/4

Consider the case of a single test unit which must be tested at some level of test stress. Suppose that the test stress level is free to be determined, and that only the survival or nonsurvival of the unit is observed. It is assumed that the unit is designed to withstand a known and specified design stress level. A Bayesian model is developed for determining the required level of test stress which maximizes the expected probabilty of survival at the design stress level. Engineering experience from similar past tests on similar units is used to fit the model. A practical application illustrates the method. The sensitivity of the procedure to changes in the parameters used in fitting the model is also examined. The procedure is fairly insensitive to three parameters required in fitting the model in the example. Author (GRA)

N77-33531# Oak Ridge Y-12 Plant, Tenn.

STUDY OF THE RELATIONSHIPS OF THREE FACTORS ON ERRORS IN INSPECTION

R. S. Leete, Jr. and W. E. Lever Apr. 1977 79 p

(Contract W-7405-eng-26)

(Y-2075) Avail: NTIS HC A05/MF A01

The likelihood of each type of gaging error for many combinations of factors is shown. Thus, for example, with knowledge of the tolerance for a feature and an estimate of the variation of the fabricating process, a gage designer can objectively assess how critical his gaging repeatability is in terms of errors of inspection. This assessment should prove more cost effective than any rule of thumb such as 'gaging repeatability should be 10 percent of the feature tolerance'. ERA

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N77-33532# Naval Construction Research Establishment, Dunfermline (Scotland).

ELASTIC PLATE BUCKLING USING FINITE ELEMENTS

G. C. Mitchell Feb. 1976 30 p refs

(NCRE/R627; BR51061) Copyright. Avail: Issuing Activity

Von Karman's large-deflection theory for elastic plates is used to define the stability criterion in terms of stored strain energy. The analytic expressions are then approximated using a mesh of 9 degree of freedom triangular finite elements of the type first proposed by Zienkiewicz. Finally, the use of a computer program, based on the preceding theory, is described, and results from solution convergence studies are presented. Author

N77-33533 Naval Construction Research Establishment, Dunfermline (Scotland).

PLANE GRILLAGE SUITE OF PROGRAMS

W. J. Simons 19 Jul. 1976 58 p refs

(NCRE/R637; BR55362) Copyright. Avail: Issuing Activity

A suite of programs is described for calculating deflections and stresses, buckling loads and natural frequencies of a plane grillage. The suite has additional facilities for generating and checking data, and for larger problems, an out of core solution for stresses. Author

N77-33534 Naval Construction Research Establishment, Dunfermline (Scotland).

STATIC AND DYNAMIC RESPONSE CALCULATIONS FOR THE NEW COULPORT LAUNCHER PISTON ASSEMBLY

C. S. Smith Jun. 1973 21 p refs

(NCRE/N206; BR58399) Copyright. Avail: Issuing Activity

An independent evaluation of flexural behavior of the piston assembly under retardation forces is carried out to provide a check on design calculations. Calculations were carried out for two alternative idealizations of the assembly. In the first, more accurate idealization in the forward portion (i.e. the retardation ram) was represented by 6 uniform beam elements contained between node points 1 and 7; the rear portion (i.e. the distance piece) was represented by 5 beam elements between nodes 7 and 12. In the second idealization the ram was represented by 3 elements between nodes 1 and 4 and the distance piece by 4 elements between nodes 4 and 8. The analysis was confined to flexure in the plane of the carriage-piston assembly; shear deformations and initial deflections were ignored. Calculations indicate that under constant deceleration of 400 g from an initial velocity of 374 ft/sec the redesigned Coulport Launcher piston would experience: (1) a maximum tip displacement of 2.1 in. in the absence of hydraulic restraint or (2) a maximum tip displacement of 0.135 in. in the presence of a concentrated hydraulic stiffness of 5 times 10000 lb/in. at the tip of the ram. I.M.

N77-33535*# Grumman Aerospace Corp., Bethpage, N.Y. Materials and Structural Mechanics.

PLANS; A FINITE ELEMENT PROGRAM FOR NONLINEAR ANALYSIS OF STRUCTURES. VOLUME 2: USER'S MANUAL

A. Pifko, H. Armen, Jr., A. Levy, and H. Levine May 1977 251 p refs

(Contract NAS1-13148)

(NASA-CR-145244) Avail: NTIS HC A12/MF A01 CSCL 13M

The PLANS system, rather than being one comprehensive computer program, is a collection of finite element programs used for the nonlinear analysis of structures. This collection of programs evolved and is based on the organizational philosophy in which classes of analyses are treated individually based on the physical problem class to be analyzed. Each of the independent finite element computer programs of PLANS, with an associated element library, can be individually loaded and used to solve the problem class of interest. A number of programs have been developed for material nonlinear behavior alone and for combined geometric and material nonlinear behavior. The usage, capabilities, and element libraries of the current programs include: (1) plastic analysis of built-up structures where bending and membrane effects are significant, (2) three dimensional elastic-plastic analysis, (3) plastic analysis of bodies of revolution, and (4) material and geometric nonlinear analysis of built-up structures. Author

N77-33536*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

DUCTILITY NORMALIZED-STRAINRANGE PARTITIONING LIFE RELATIONS FOR CREEP-FATIGUE LIFE PREDICTIONS

G. R. Halford, J. F. Saltsman, and M. H. Hirschberg 1977 17 p refs Presented at Conf. on Environ. Effects and Degradation of Eng. Mater., Blacksburg, Va., 10-12 Oct. 1977; sponsored by Va. Polytech. Inst.

(NASA-TM-73737) Avail: NTIS HC A02/MF A01 CSCL 20K

Procedures based on Strainrange Partitioning (SRP) are presented for estimating the effects of environment and other influences on the high temperature, low cycle, creep fatigue resistance of alloys. It is proposed that the plastic and creep,

ductilities determined from conventional tensile and creep rupture tests conducted in the environment of interest be used in a set of ductility normalized equations for making a first order approximation of the four SRP inelastic strainrange life relations. Different levels of sophistication in the application of the procedures are presented by means of illustrative examples with several high temperature alloys. Predictions of cyclic lives generally agree with observed lives within factors of three. Author

N77-33537# Oakland Univ., Rochester, Mich. School of Engineering.

DIRECT DETERMINATION OF FLEXURAL STRAINS IN PLATES USING PROJECTED GRATINGS

C. Y. Liang, Y. Y. Hung, A. J. Durelli, and J. D. Hovanesian Jun. 1977 33 p refs

(Contract N00014-76-C-0487)

(AD-A041917) Avail: NTIS HC A03/MF A01 CSCL 20/11

It is proposed in this paper to use projected gratings to determine principal strains in plates subjected to bending. The method requires the rotation of one photograph of the deformed grating over a copy of itself, the rotation taking place about the point at which the bending strains are desired. The idea previously suggested by Stetson to double differentiate holograms of bent plates has been extended and verified with an application to a plate subjected to twisting. The proposed method is easy to use and permits the determination of principal strains in plates subjected to much larger deflections than the ones that can be studied using holograms. Suggestions to improve the precision of the determination are also made. Author (GRA)

N77-33538# Construction Engineering Research Lab. (Army), Champaign, Ill.

CORROSION BEHAVIOR OF STEEL FIBROUS CONCRETE Final Report

D. C. Morse and G. R. Williamson May 1977 40 p

(AD-A041339; CERL-TR-M-217) Avail: NTIS HC A03/MF A01 CSCL 11/2

This report presents the results of an investigation into four aspects of the corrosion behavior of steel fibrous concrete: (1) The behavior of cracked and uncracked metallic and nonmetallic fibrous concrete subjected to a natural wet-dry, freeze-thaw saltwater environment; (2) The effect of crack width on the corrosion of fibers bridging the crack; (3) The effect of various durations of exposure to a corrosive environment on constant-crack-width and uncracked steel fibrous concrete specimens; and (4) The effect of fatigue. Results indicate that good quality, air-entrained, uncracked steel fibrous concrete does not experience any undesirable strength changes when subjected to a seawater environment for up to 1.5 years. Results also indicate that unworking cracks less than 0.01 in. (0.25 mm) wide do not provide sufficient passageway for corrosive liquids to cause corrosion of the fibers bridging the crack, while fibers bridging larger cracks can be expected to corrode. The fatigue behavior of uncracked, good quality, air-entrained steel fibrous concrete at 65 percent of the first cracked stress level was found to be unaffected by exposure to a saltwater environment.

Author (GRA)

N77-33539# Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Civil and Environmental Engineering.

STRENGTH OF STEEL FIBER CONCRETE IN ADVERSE ENVIRONMENTS Final Report

Gordon B. Batson Jun. 1977 58 p refs

(Contract DACA88-75-C-0004)

(AD-A041380; CERL-SR-M-218) Avail: NTIS HC A04/MF A01 CSCL 11/2

This report presents the results of an investigation of the strength of cracked steel-fiber-reinforced concrete subjected to a flowing salt water environment. The testing procedure was adapted from the plane strain fracture toughness method of testing metallic materials using a modified wedge opening loading (WOL) specimen. Concrete specimens were cast with 1.0, 1.5, and 2.0 percent concentrations of steel fibers by volume of concrete and cured for 28 days in a moisture room. After 28 days, a notch was sawed in each of the specimens with a masonry saw, and a small crack was propagated from the tip of the notch by mechanical means. Control specimens then underwent a compliance testing procedure to determine the work rate necessary to propagate a crack through the specimens. The remaining specimens were subjected to a flowing saltwater environment for four different exposure intervals. The strain energy release rate of the specimens exposed to saltwater was determined and compared with that of the control specimens. The rate of change of strain energy release rate decreased with increasing time and with increasing steel fiber content. Author (GRA)

N77-33540# Lockheed-Georgia Co., Marietta. Engineering Structural and Materials Lab. Dept.

ACOUSTIC EMISSION MONITORING OF CRACK PROPAGATION ON THE EXPEDITED WING FATIGUE TEST ARTICLE X993 Final Technical Report, Jun. 1975 - Oct. 1976

William M. Pless, Cliff D. Bailey, and James M. Hamilton Dec. 1976 128 p refs

(Contract F33615-75-C-5249)

(AD-A041107; LG77ER0042) Avail: NTIS HC A07/MF A01 CSCL 11/6

This final report describes work accomplished, under USAF contract, whose objective was to evaluate the ability of acoustic emission techniques to detect crack growth in a large full-production aircraft wing fatigue test article subjected to simulated flight spectra. Fatigue cracks were propagated at seventeen selected pre-damaged fastener holes in eight test areas on the test article. The flight load spectra consisted of fifty variable tension-tension gust cycles followed by 1/2 of a compressive ground cycle. Sixteen of the fastener holes were monitored with a 32-channel acoustic emission flaw locator system containing a computer, CRT monitor, input/output teleprinter console and tape recorder. Linear and triangular sensor arrays were used to detect and locate cracks. Twelve fatigue cracks were detected at fifteen fastener holes monitored where crack growth occurred. Acoustic emission data were correlated to crack growth data, determined through fractographic analysis, for several of the test cracks. Complex structural features which were accommodated successfully for detection of AE across joints are described.

Author (GRA)

N77-33541# Naval Surface Weapons Center, White Oak, Md.

WUNDY CALCULATIONS OF THE COLLAPSE VELOCITIES OF A STAGED IMPLODING CYLINDER Final Report

James P. Coughlin 18 Apr. 1977 61 p

(AD-A041064; NSWC/WOL/TR-76-145) Avail: NTIS HC A04/MF A01 CSCL 19/4

This report describes numerical computations for imploding staged cylinders. The calculations were made with the WOL's one-dimensional code, Wundy. Six different geometries were examined and the positions and velocities of the inner and outer surfaces of both the core and the staging were calculated. In the course of these calculations, a spurious oscillation arose and the steps taken to deal with it are described. Author (GRA)

N77-33542# Northwestern Univ., Evanston, Ill. Dept. of Materials Science.

A PORTABLE RESIDUAL STRESS ANALYZER

M. R. James and J. B. Cohen Jul. 1977 38 p refs

(Contract N00014-75-C-0580; NR Proj. 031-733)

(AD-A041831; TR-19) Avail: NTIS HC A03/MF A01 CSCL 20/1

A portable device for stress measurements based on a position sensitive detector and using a miniature air-cooled X-ray tube was built to demonstrate the potential of such a system. The measuring apparatus, weighing 11 kg, could be held by one person with the electronics housed in a separate cabinet. A variety of steel samples, having from 0 to -700 MPa were tested by comparing measurements made on a diffractometer to those made with the portable device. The device proved to be accurate and accomplished the entire measurement using two psi tilts to a statistical error of less than + or - 40 MPa in under 20 seconds on all samples. (In some cases in 4 seconds.) The portability of the apparatus and rapid measurement time suggest applications for the X-ray stress measurement never possible before, such as on-sight inspection during fabrication or in-field measurements. Author (GRA)

N77-33543# Brown Univ., Providence, R. I. Div. of Engineering.

ON DYNAMIC PLASTIC MODE FORM SOLUTIONS
P. S. Symonds and C. T. Chon Jun. 1977 27 p refs
(Contract N00014-75-C-0860; Grant NSF ENG-74-21258)
(AD-A042361; N00014-0860/2) Avail: NTIS HC A03/MF A01 CSCL 20/11

The paper discusses the significance and calculation of dynamic plastic mode form solutions for small deflections of structures of rigid-perfectly plastic materials subjected to load systems of fixed distribution and magnitude. These solutions have separated form, with velocity the product of a scalar function of time by a vector-valued function of space variables. The relation is shown on the one hand to mode form solutions for a structure of viscoplastic material and on the other hand to limit load solutions for those of perfectly plastic behavior. Numerical examples are given for circular plates of material obeying Tresca and Mises' Laws. Author (GRA)

N77-33544# Ballistic Research Labs., Aberdeen Proving Ground, Md.
COUPLING OF X-RAY DEPOSITION STRUCTURAL RESPONSE Final Report
Henry L. Wisniewski Jun. 1977 65 p refs Supersedes BRL-IMR-474
(DA Proj. 1W1-62118-AH-75)
(AD-A042667; BRL-MR-2761; BRL-IMR-474)
HC A04/MF A01 CSCL 20/11

The need for a reliable and efficient method to predict the structural response of target structures to X-ray loading prompted the coupling of the X-ray deposition program, RIP, to the structural response program, PETROS 3. The RIP program predicts that material on the front face will blow-off as liquid-solid, liquid and vapor, thus delivering an impulsive load. Simultaneously a stress wave is transmitted through the residual solid material causing spallation on the back face. The RIP program was modified to provide specific output characteristics of the residual solid material namely: thickness, mean transverse velocity, and through-thickness distribution of temperature and tangential stresses which remain after the transverse elastoplastic stress waves have dissipated. The BRL version of PETROS 3 program was then modified to accept these data as initial conditions. A structural response test case was treated using both undegraded and degraded material properties, the solutions of which show a large disparity in output results. Author (GRA)

N77-33545# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
APPLICATIONS OF THE EXTREMAL PRINCIPLES OF ELASTICITY TO THE DETERMINATION OF STRESS INTENSITY FACTORS
Peter J. Torvik Jul. 1977 52 p refs
(AD-A042669; AFIT-TR-77-3) Avail: NTIS HC A04/MF A01 CSCL 20/11

A method for determining Stress Intensity Factors in edge cracked elastic sheets subjected to arbitrary in-plane loadings is presented. The method employs an eigenfunction expansion, with the coefficients chosen through the Energy Principles of Elastostatics. Two-dimensional plane problems with prescribed boundary tractions, prescribed boundary displacement, and mixed problems are considered. Examples given include plates of finite length with edge cracks and plates with cracks originating from the tip of edge notches. Results are given for stress intensity factors in rectangular tensile sheets of various aspect ratios, and for rectangular sheets with prescribed uniform end displacements. Calibration curves for the Fatigue Crack Life Gauge are developed, and some implications for gauge design are noted. Author (GRA)

N77-33546# Army Construction Engineering Research Lab., Champaign, Ill.
GUIDELINES FOR EVALUATING THE SEISMIC RESISTANCE OF EXISTING BUILDINGS Final Report
John M. Lybas Jul. 1977 130 p refs
(DA Proj. 4A7-62719-AT-41)
(AD-A042873; CERL-TR-M-213) Avail: NTIS HC A07/MF A01 CSCL 13/13

This report presents a methodology for evaluating an existing building's seismic resistance. The method uses a design response spectrum and modal analysis techniques to compute a linearly elastic structural response. This is compared to the structure's yield capacity to obtain a factor denoting the structure's required energy dissipation capacity. Charts suitable for design office application are provided for use in estimating the levels of structural damping and ductility consistent with the required energy dissipation. Various structural characteristics pertinent to the building's suitability for seismic loading are discussed. The method compares these structural characteristics to the computed structural damping and ductility to reach a judgement concerning the likelihood of structural failure during an earthquake. Several appendices are included to provide additional technical support for the methodology. Author (GRA)

N77-33547# Sandia Labs., Albuquerque, N. Mex. Design Technology Div.
EVALUATION OF DESIGN SAFETY FACTORS FOR TIME-DEPENDENT BUCKLING
C. M. Stone and R. E. Nickell Feb. 1977 30 p refs
(Contract EY-76-C-04-0789)
(SAND-76-0721; NUREG-0179; NRC-7) Avail: NTIS HC A03/MF A01

The secondary creep strain rate exponent is examined. The analysis is made using results obtained numerically for an axially-loaded, cylindrical shell with varying secondary creep exponents. A computationally efficient scheme for analyzing creep buckling problems is also presented. ERA

N77-33548# Argonne National Lab., Ill.
NONLINEAR FORMULATION OF FINITE ELEMENT BY COROTATIONAL COORDINATES
B. J. Hsieh Jan. 1977 28 p refs
(Contract W-31-109-eng-38)
(ANL-CT-77-9) Avail: NTIS HC A03/MF A01

Aspects of the finite element formulation in corotational coordinates are discussed. This is a coordinate system that rotates and translates with the element to which it is allocated. It is shown that the displacement field of each element can be separated into rigid-body-motion displacements and deformation displacements by using Gauss's polar decomposition theorem. The strains, stresses, and internal forces are computed in the corotational coordinates. This approach greatly simplifies the computations of strains and stresses when the displacements and strains are not small. ERA

N77-33549# California State Dept. of Transportation, Sacramento. Transportation Lab.
CEMENT CONTENT OF FRESH CONCRETE Final Report, 1967 - 1976
J. H. Woodstrom and B. F. Neal Sep. 1976 40 p
(PB-266931/5; CA-DOT-TL-5149-1-76-55; Rept-19303-635149C; FHWA/CA/TL-5149-76-55) Avail: NTIS HC A03/MF A01 CSCL 13C

A test method for determining the cement content of fresh concrete was developed for both laboratory and field use. Using hydrochloric acid to keep a concrete mixture constantly neutralized, the cement content can be determined to within about 1/4 sack per cubic yard. Field tests indicate the method is most useful in evaluating the performance of a concrete mixer. Relative cement contents of various portions of a batch can be determined in about one hour. Adjustments to aggregate and/or cement feed can then be made as needed to improve mixing uniformity. GRA

N77-33550# Oklahoma Univ., Norman. School of Aerospace, Mechanical and Nuclear Engineering.
RESEARCH INITIATION: MIXED AND HYBRID FINITE ELEMENT ANALYSIS OF PROBLEMS IN STRUCTURAL MECHANICS Final Report, Sep. 1975 - Mar. 1977
J. N. Reddy May 1977 113 p refs
(Grant NSF ENG-75-10265)
(PB-268300/1; OU-AMNE-77-3) Avail: NTIS HC A06/MF A01 CSCL 20K

Mixed and hybrid variational formulations of problems in heat conduction, fluid flow, and thin plate bending, free vibration and buckling are presented. Corresponding mixed models were developed. Mathematical properties, such as existence and uniqueness of solutions and error estimates are given. A number of problems from heat conduction, fluid flow and plate

theory were solved using the mixed models, despite their simplicity in formulation and computer programming, yield better accuracies for the displacements, moments, buckling loads and natural frequencies in the thin plate analysis. GRA

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography. For instrumentation see *35 Instrumentation and Photography*.

N77-33551*+ New Mexico Univ., Albuquerque. Technology Application Center.
LITERATURE REVIEW OF THE REMOTE SENSING OF NATURAL RESOURCES Quarterly Report, Jul. - Sep. 1977
Charles B. Fears, ed. and Michael H. Inglis, ed. 1977 197 p Sponsored by NASA
(NASA-CR-155190; QR-3) Avail: NTIS for foreign requestors only. Domestic orders, Univ. of New Mexico, Tech. Application Center, Albuquerque HC $10.00 CSCL 05B

Abstracts of 596 documents related to remote sensors or the remote sensing of natural resources by satellite, aircraft, or ground-based stations are presented. Topics covered include general theory, geology and hydrology, agriculture and forestry, marine sciences, urban land use, and instrumentation. Recent documents not yet cited in any of the seven information sources used for the compilation are summarized. An author/key word index is provided. Author

N77-33552 Oregon State Univ., Corvallis.
STEREOPHOTOGRAMMETRIC RECONNAISSANCE OF OCEAN WAVE/SEA ICE INTERACTION Ph.D. Thesis
David Elam Amstutz 1977 172 p
Avial: Univ. Microfilms Order No. 77-15364

Full scale measurements of pertinent parameters of ocean wave/sea ice interactions were obtained using an airborne laser to accurately measure the flying altitude of two aircraft over the East Greenland Drift Stream, south of Denmark. Descriptive analysis of the stereophotogrammetric data obtained shows that the ocean wave attenuation is dependent upon the floe size and concentration of the ice canopy. Wave scattering is the primary process accounting for the measured attenuation of wave amplitude. The scattering process has a maximum effect for wavelength (lambda) when the diameter (d) of the floes of greatest concentration is a ratio (d/lambda) is greater than 0.3 -0.4. Wavelengths of greatest relative amplitude, for which floe diameters were too small to scatter using the d/lambda criteria, were observed to attenuate rapidly with increasing penetration of the ice canopy. Dissert. Abstr.

N77-33553*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
[APPLICATIONS OF REMOTE SENSING] Annual Technical Summary Report, 1 Jun. 1976 - 31 May 1977
D. A. Landgrebe, Principal Investigator 1977 61 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. ERTS
(Contract NAS9-14970)
(E77-10183; NASA-CR-151451; T-1314/5; MA-657T) Avail: NTIS HC A04/MF A01 CSCL 05B

There are no author-identified significant results in this report.

N77-33554*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
APPLICATION OF REMOTE SENSING TECHNOLOGY TO THE SOLUTION OF PROBLEMS IN THE MANAGEMENT OF RESOURCES IN INDIANA Semiannual Status Report, 1 Dec. 1976 - 31 May 1977
R. A. Weismiller and R. P. Mroczynski, Principal Investigators 31 May 1977 19 p Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. ERTS
(Grant NGL-15-005-186)
(E77-10223; NASA-CR-154983) Avail: NTIS HC A02/MF A01 CSCL 05A

The author has identified the following significant results. The Lydick, South Bend West, South Bend East, and Osceola quadrangles were successfully classified into twenty-six cover types with a high degree of accuracy. The ability of this computer-assisted classification system to delineate various stages of urban development, from heavy industry to new suburban development, was of particular interest to the planning commission. The classification is clearly more beneficial than the existing agricultural soils and topographic maps, because it shows the current ground cover conditions all on one map. It shows how an area is developing along with the specific type and location of new development. The classification also shows at a glance whether development is taking place in an area suitable for development or if growth is taking place in prime agricultural land, areas of poor foundation material, or other places where development is not desirable.

N77-33555*# Tokyo Univ. (Japan).
INVESTIGATION OF ENVIRONMENTAL CHANGE PATTERN IN JAPAN. CLASSIFICATION OF SHORELINES Final Report
Takakazu Maruyasu and Taisuke Watanabe, Principal Investigators (Maritime Safety Agency, Tokyo, Japan) 10 Aug. 1977 11 p Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. ERTS
(E77-10224; NASA-CR-155014) Avail: NTIS HC A02/MF A01 CSCL 04B

There are no author-identified significant results in this report.

N77-33556*# Texas A&M Univ., College Station. Remote Sensing Center.
SPECTRAL MEASUREMENT OF WATERSHED COEFFICIENTS IN THE SOUTHERN GREAT PLAINS Progress Report, 1 Mar. - 31 May 1977
Bruce J. Blanchard, Principal Investigator Jun. 1977 19 p ERTS
(Contract NAS5-22534)
(E77-10225; NASA-CR-155015; RSC-3273-7) Avail: NTIS HC A02/MF A01 CSCL 08H

There are no author-identified significant results in this report.

N77-33557*# Department of Agricultural Technical Services, Pretoria (South Africa).
MONITORING THE EXTENT AND OCCURRENCE OF FIRE IN THE DIFFERENT VELD TYPES OF SOUTH AFRICA WITH PARTICULAR REFERENCE TO ITS ECOLOGICAL ROLE AND ROLE IN RANGE MANAGEMENT Final Report
Denzil Edwards, Principal Investigator Aug. 1977 71 p refs Sponsored by NASA ERTS
(E77-10226; NASA-CR-155016) Avail: NTIS HC A04/MF A01 CSCL 08F

The author has identified the following significant results. Veld burning was recorded from LANDSAT imagery covering approximately 75 million ha or 62% of the surface of the eastern part of South Africa. All basic data on the location, areas, and numbers of burns for 10 biomes, composed of 67 veld types, are available on 1:250,000 and 1:500,000 map overlays, and are summarized on small scale maps showing fire distribution and amount burned in classes per 15 minute square of latitude and longitude. Veld burning is not randomly distributed, but is almost continuous over a broad belt, widest in the north and narrowing southeastwards, and then southwestwards between the eastern escarpment and the sea. It is shown that over almost the whole area, the overall pattern of veld burning is

clearly marked out as early as July in midwinter, subsequent development being merely an intensification of the pattern.

N77-33558*# Tokyo Univ. (Japan).
INVESTIGATION OF ENVIRONMENTAL CHANGE PATTERN IN JAPAN. UTILIZATION OF LANDSAT-2 DATA FOR FISHERIES
Takakazu Maruyasu and Taisuke Watanabe, Principal Investigators 10 Aug. 1977 17 p Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. ERTS
(E77-10227; NASA-CR-155017) Avail: NTIS HC A02/MF A01 CSCL 04B

The author has identified the following significant results. MSS data provided extensive and simultaneous information about marine environmental conditions, such as the shift of the Kuroshio, fall and rise of coastal water mass, distribution of water masses, locations of vortex and current rips, exchanges of water between embayment and open ocean effluent rivers, fertility of plankton, red tide, pollution, etc.

N77-33559*# Tokyo Univ. (Japan).
APPLICATION OF LANDSAT MSS DATA TO THE STUDY OF OCEANOGRAPHICAL ENVIRONMENT
Takakazu Maruyasu, Principal Investigator, Kiyoshi Tsuchiya (National Space Development Agency, Tokyo, Japan), Hiroaki Ochiai (Toba National Merchant Marine Coll., Mieken, Japan), and Kaname Takeda (Science and Technology Agency, Tokyo, Japan) [1977] 13 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. ERTS
(E77-10228; NASA-CR-155018) Avail: NTIS HC A02/MF A01 CSCL 08J

The author has identified the following significant results. LANDSAT MSS data of a three year time lapse indicate change of sea surface condition in Seto Inland Sea and coastal region. The red tide which formerly concentrated in the bay or inland sea now extends into an open sea. A small ocean vortex similar to mesoscale atmospheric vortex is revealed by the band 4 image of the satellite data. A manual photographic method applied to a single band image of MSS is effective in detecting sea surface pollution.

N77-33560*# Tokyo Univ. (Japan).
SIGNIFICANT APPLICATIONS OF LANDSAT-2 MSS DATA TO MARINE ENVIRONMENT
Takakazu Maruyasu, Principal Investigator and Hiroaki Ochiai (Toba Merchant Marine Coll., Mieken, Japan) [1977] 22 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. ERTS
(E77-10229; NASA-CR-155019) Avail: NTIS HC A02/MF A01 CSCL 08J

There are no author-identified significant results in this report.

N77-33561*# Tokyo Univ. (Japan).
GENERAL PATTERN OF THE TURBID WATER IN THE SETO-INLAND SEA EXTRACTED FROM MULTISPECTRAL IMAGERIES BY THE LANDSAT-1 AND 2
Takakazu Maruyasu, Principal Investigator and Kantaro Watanabe (Tokai Univ., Japan) [1976] 21 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. ERTS
(E77-10230; NASA-CR-155020) Avail: NTIS HC A02/MF A01 CSCL 08J

The author has identified the following significant results. Each distribution pattern of turbid water changes with the time in accordance with daily tides, seasonal variation of tides, and occasional rainfall. Two cases of successfully repeated LANDSAT observations for the same sea regions suggested a general pattern of turbid water could be extracted for each region. Photographic and digital processes were used to extract patterns of turbid water separately from the cloud and smog-layer in MSS 4, 5, and 7 imageries. A mosaic of image-masked imageries displays a general pattern of turbid water for almost the entire Seto Inland Sea. No such pattern was extracted for the Aki-Nada south of Hiroshima City where the water is fairly polluted, nor for the Iyo-Nada where the water is generally clearer than in other regions of the Seto Inland Sea.

N77-33562*# Tokyo Univ. (Japan).
ENVIRONMENTAL CHANGE PATTERN IN CENTRAL JAPAN AS REVEALED BY LANDSAT DATA
Takakazu Maruyasu, Principal Investigator, Kiyosh Tsuchiya (National Space Development Agency, Tokyo, Japan), and Hiroaki Ochiai (Toba National Merchant Marine Coll., Toba-city, Japan) [1977] 10 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. ERTS
(E77-10231; NASA-CR-155021) Avail: NTIS HC A02/MF A01 CSCL 04B

The author has identified the following significant results. A patched cirrus reported by weather stations was hardly recognizable by the eye in LANDSAT MSS data of a three year time lapse. The cloud cover affected radiance values significantly in band 4, while its effect was minimal in bands 6 and 7 (near infrared spectra). The cross correlation coefficient analysis between the two images indicated that the highest value obtained in central Japan was 0.963 for the area where little change occurred in land use over the 3 yr period. An analysis of land use in Nagoya showed little change in the metropolitan area while a fairly large change occurred in the northern periphery of the city where large scale housing projects are located.

N77-33563*# Tokyo Univ. (Japan).
INVESTIGATION OF ENVIRONMENTAL CHANGE PATTERN IN JAPAN. INVESTIGATION OF VARIATIONS IN THE PROMINENT OCEANIC CURRENT, KUROSHIO Final Report
Takakazu Maruyasu and Daitaro Shoji, Principal Investigators (Maritime Safety Agency, Tokyo, Japan) Aug. 1977 25 p Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. ERTS
(E77-10232; NASA-CR-155022) Avail: NTIS HC A02/MF A01 CSCL 04B

The author has identified the following significant results. It was confirmed that band 4 and 5 had some information as to the sea surface, such as spreading of coastal waters or eddy-like motion of surface water. It was concluded that the front line along the coast from Kumano-nada to Shiono-misaki in the monochromatic prints and in the pseudocolor images was a boundary between coastal waters and offshore water. Most of Ise Bay was covered by polluted water, having salinity values less than 30%, high water color scale of 6 to 8, and transparency less than 5 m.

N77-33564*# Department of Scientific and Industrial Research, Wellington (New Zealand). Physics and Engineering Lab.
SEISMOTECTONIC, STRUCTURAL, VOLCANOLOGIC, AND GEOMORPHIC STUDY OF NEW ZEALAND; INDIGENOUS FOREST ASSESSMENT IN NEW ZEALAND; MAPPING, LAND USE, AND ENVIRONMENTAL STUDIES IN NEW ZEALAND, VOLUME 1 Final Report
Mervyn C. Probine, Richard P. Suggate, Michael G. McGreevy, and Ian F. Stirling, Principal Investigators Sep. 1977 140 p refs Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. ERTS
(E77-10233; NASA-CR-155023; Rept-587-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 08B

The author has identified the following significant results. Results of the atmospheric extinction measurements show clearly the greater opacity of the atmosphere in MSS band 4 which is due to Rayleigh scattering. Atmospheric water vapor absorbs strongly in a wide region between 900 nm and 1000 nm, and this results in a consistently higher extinction coefficient than would otherwise be expected in MSS band 7. The short term fluctuations tend to be greater in band 7 than in the other bands, and this effect is probably due to variations of water vapor concentration in the instrument line of sight. These high extinction coefficients and short term fluctuations in band 7 were observed at Menindee which is in a semi-desert region in western New South Wales.

N77-33565*# Department of Scientific and Industrial Research, Wellington (New Zealand). Physics and Engineering Lab.
SEISMOTECTONIC, STRUCTURAL, VOLCANOLOGIC, AND GEOMORPHIC STUDY OF NEW ZEALAND; INDIGENOUS FOREST ASSESSMENT IN NEW ZEALAND; MAPPING, LAND USE, AND ENVIRONMENTAL STUDIES IN NEW ZEALAND, VOLUME 2 Final Report
Mervyn C. Probine, Richard P. Suggate, Michael G. McGreevy, and Ian F. Stirling, Principal Investigators Sep. 1977 133 p refs Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. ERTS
(E77-10234; NASA-CR-155024; Rept-587-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 08B

The author has identified the following significant results. Ship detection via LANDSAT MSS data was demonstrated. In addition, information on ship size, orientation, and movement was obtained. Band 7 was used for the initial detection followed by confirmation on other MSS bands. Under low turbidity, as experienced in open seas, the detection of ships 100 m long was verified and detection of ships down to 30 m length theorized. High turbidity and sea state inhibit ship detection by decreasing S/N ratios. The radiance effect from snow of local slope angles and orientation was also studied. Higher radiance values and even overloading in three bands were recorded for the sun-facing slope. Local hot spots from solar reflection appear at several locations along transect D-C in Six Mile Creek Basin during September 1976.

N77-33566*# Department of Scientific and Industrial Research, Wellington (New Zealand). Physics and Engineering Lab.
SEISMOTECTONIC, STRUCTURAL, VOLCANOLOGIC, AND GEOMORPHIC STUDY OF NEW ZEALAND; INDIGENOUS FOREST ASSESSMENT IN NEW ZEALAND; MAPPING, LAND USE AND ENVIRONMENTAL STUDIES IN NEW ZEALAND, VOLUME 3 Final Report
Mervyn C. Probine, Richard P. Suggate, Michael G. McGreevy, and Ian F. Stirling, Principal Investigators Sep. 1977 187 p refs Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. ERTS
(E77-10235; NASA-CR-155025; Rept-587-Vol-3) Avail: NTIS HC A09/MF A01 CSCL 08B

The author has identified the following significant results. The present resolution of LANDSAT precludes its use for topographic mapping at scales larger than 1:250,000. Encouraging potential was displayed for environmental and land use studies at scales up to 1:100,000.

N77-33567*# Food and Agriculture Organization of the United Nations, Rome (Italy).
THE APPLICATION OF ERTS IMAGERY TO THE FAO/UNESCO SOIL MAP OF THE WORLD Final Report
Raoul J. Dudal and A. J. Pecrot, Principal Investigators 15 May 1977 4 p Sponsored by NASA ERTS
(E77-10236; NASA-CR-155026) Avail: NTIS HC A02/MF A01 CSCL 08B

The author has identified the following significant results. It was concluded that direct identification and mapping of the various soil degradation forms and intensities from the color composite imager was generally difficult, if not impossible. The imagery, however, provided valuable information on some main environmental criteria which can be used in connection with other available field data to assess actual soil degradation and estimate soil degradation hazards.

N77-33568*# South Dakota State Univ., Brookings.
APPLICATION OF REMOTE SENSING IN SOUTH DAKOTA TO PROVIDE ACCURATE INVENTORIES OF AGRICULTURAL CROPS, ENHANCE CONTRAST IN PHOTOGRAPHIC PRODUCTS, MONITOR RANGELAND HABITAT LOSS, MAP ASPEN, AND PREPARE HYDROGEOLOGIC SURVEYS Annual Progress Report, 1 Jul. 1976 - 30 Jun. 1977
Victor I. Myers, Principal Investigator, K. J. Dalsted, R. G. Best, J. R. Smith, J. C. Eidenshink, F. A. Schmer, A. S. Andrawis, and P. H. Rahn 30 Jun. 1977 99 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. ERTS
(Grant NGL-42-003-007)
(E77-10237; NASA-CR-155027; SDSU-RSI-77-08) Avail: NTIS HC A05/MF A01 CSCL 02C

The author has identified the following significant results. Digital analysis of LANDSAT CCT's indicated that two discrete spectral background zones occurred among the five soil zone. K-CLASS classification of corn revealed that accuracy increased when two background zones were used, compared to the classification of corn stratified by five soil zones. Selectively varying film type developer and development time produces higher contract in reprocessed imagery. Interpretation of rangeland and cropped land data from 1968 aerial photography and 1976 LANDSAT imagery indicated losses in rangeland habitat. Thermal imagery was useful in locating potential sources of sub-surface water and geothermal energy, estimating evapotranspiration, and inventorying the land.

N77-33569*# Brevard County Planning Dept., Merritt Island, Fla.
LANDSAT PLANNING APPLICATIONS IN EAST CENTRAL FLORIDA Final Report, 12 Feb. 1975 - 11 Feb. 1977
John W. Hannah, Principal Investigator, Garland L. Thomas, Fernando Esparza (NASA. Kennedy Space Center), and James J. Millard (NASA. Kennedy Space Center) Apr. 1977 215 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. ERTS
(Contract NAS5-20907)
(E77-10238; NASA-CR-155028; BCPD-L2-8) Avail: NTIS HC A10/MF A01 CSCL 08B

There are no author-identified significant results in this report.

N77-33570*# Missouri Dept. of Natural Resources, Rolla.
STRUCTURAL LINEAMENT AND PATTERN ANALYSIS OF MISSOURI, USING LANDSAT IMAGERY Final Report, Mar. 1975 - Aug. 1977
James A. Martin and Geza Kisvarsanyi, Principal Investigators Sep. 1977 151 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. ERTS
(Contract NAS5-20937)
(E77-10239; NASA-CR-155029) Avail: NTIS HC A08/MF A01 CSCL 08B

The author has identified the following significant results. Major linear, circular, and arcuate traces were observed on LANDSAT imagery of Missouri. Lineaments plotted within the state boundaries range from 20 to nearly 500 km in length. Several extend into adjoining states. Lineament plots indicate a distinct pattern and in general reflect structural features of the Precambrian basement of the platform. Coincidence of lineaments traced from the imagery and known structural features in Missouri is high, thus supporting a causative relation between them. The lineament pattern apparently reveals a fundamental style of the deformation of the intracontinental craton. Dozens of heretofore unknown linear features related to epirogenic movements and deformation of this segment of the continental crust were delineated. Lineaments and mineralization are interrelated in a geometrically classifiable pattern.

N77-33571*# Arizona Univ., Tucson. Office of Arid Lands Studies.
APPLIED REMOTE SENSING PROGRAM (ARSP) Final Report
1 Jul. 1977 16 p Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. ERTS
(E77-10240; NASA-CR-155030) Avail: NTIS HC A02/MF A01 CSCL 08B

There are no author-identified significant results in this report.

N77-33572*# Norwegian Water Resources and Electricity Board, Oslo.
SNOWMAPPING IN SOUTHERN NORWAY BY USE OF LANDSAT IMAGERY Final Report
Kelge Odegaard and Johnny Skorve, Principal Investigators 25 May 1977 28 p Sponsored by NASA Original contains

imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. ERTS
(E77-10241; NASA-CR-155031) Avail: NTIS HC A03/MF A01 CSCL 08L

The author has identified the following significant results. During the summer seasons of 1975 and 1976, the snow cover was successfully monitored and measured in four basins. By use of elevation distributions for these basins combined with the measured snow cover percentage, the equivalent snow line altitude was calculated. The basins were Boevra, Jostedal, Olden, and Breim.

N77-33573*# Nebraska Univ., Lincoln. Conservation and Survey Div.
APPLICATION OF LANDSAT IMAGERY IN LAND USE INVENTORY AND CLASSIFICATION IN NEBRASKA Final Report, 10 Mar. 1975 - 10 Mar. 1977
Marvin P. Carlson and Paul M. Seevers, Principal Investigators 10 May 1977 107 p Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. ERTS
(Contract NAS5-20814)
(E77-10242; NASA-CR-155032) Avail: NTIS HC A06/MF A01 CSCL 08B

There are no author-identified significant results in this report.

N77-33574*# Tokyo Univ. (Japan).
INVESTIGATION OF ENVIRONMENTAL CHANGE PATTERN IN JAPAN. OBSERVATION OF PRESENT STATE OF AGRICULTURAL LAND-USE BY ANALYSING LANDSAT DATA
Takakazu Maruyasu, Principal Investigator and Shigechika Hayashi (National Agricultural Experiment Station, Hokkaido, Japan) [1977] 19 p Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. ERTS
(E77-10243; NASA-CR-155033) Avail: NTIS HC A02/MF A01 CSCL 02C

The author has identified the following significant results. Species and ages of grasses in pastures were identified, and soils were classified into several types using LANDSAT data. This data could be used in a wide area of cultivation, reclamation, or management planning on agricultural land.

N77-33575*# Tokyo Univ. (Japan).
INVESTIGATION OF ENVIRONMENTAL CHANGE PATTERN IN JAPAN. INVESTIGATION OF THE ECOLOGICAL ENVIRONMENT INDEX FROM OBSERVATION OF THE REGIONAL VEGETATION COVER AND THEIR GROWING CONDITION Final Report
Takakazu Maruyasu, Principal Investigator and Iwao Nakajima (Ministry of Agriculture and Forestry, Tokyo, Japan) Aug. 1977 28 p refs Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. ERTS
(E77-10244; NASA-CR-155034) Avail: NTIS HC A03/MF A01 CSCL 04B

The author has identified the following significant results. Practical use of recognition results of LANDSAT data as the base map of the field survey or the retouching work of vegetation and land use has the effective benefit to cut down the cost, labor, and time lower than 10% of a conventional method. Correct and detailed vegetation maps were prepared using combined interpretation of repetition of data of different seasons at warm and temperate forested areas.

N77-33576*# Tokyo Univ. (Japan).
AN ANALYSIS ON VEGETATION COVER BY USING LANDSAT MSS DATA
Takakazu Maruyasu, Principal Investigator and Shunji Murai [1977] 11 p Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. ERTS
(E77-10245; NASA-CR-155035) Avail: NTIS HC A02/MF A01 CSCL 08F

There are no author-identified significant results in this report.

N77-33577*# Applied Science Associates, Inc., Apex, N. C.
INVESTIGATION OF THE APPLICATIONS OF GEOS-3 RADAR ALTIMETER DATA IN REMOTE SENSING OF LAND AND SEA FEATURES
Lee S. Miller Aug. 1977 94 p refs
(Contract NAS6-2520)
(NASA-CR-141428) Avail: NTIS HC A05/MF A01 CSCL 17I

A number of GEOS-3 passes over the Atlantic Ocean and Southeastern U.S. are examined. Surface-truth and radar altimeter data comparisons are given in terms of surface correlation length, signal fluctuation characteristics, and altitude tracker dynamic response. Detailed analyses are given regarding spatial resolution and its dependency on angular backscatter behavior. These analyses include data from passes over ocean (diffuse scatter), land (large body scatter), and mirror-like inland water areas (pseudo-specular scatter). Altimeter data are examined for a pass over a large reservoir and marsh area of differing water levels; this geometry represents a stepchange in altitude which is usable in determination of the transient response of the tracker. The extent to which pulse-length limited operation pertains over-land is examined. A Wiener filter altitude algorithm is discussed which permits specification of tracker variance and geoidal spectral characteristics during operation. GRA

N77-33578*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
EARTH RESOURCES-REGIONAL TRANSFER ACTIVITY CONTRACTS REVIEW
J. Bensko, Jr., J. L. Daniels, S. W. Downs, Jr., N. L. Jones, R. R. Morton, and C. T. Paludan Aug. 1977 95 p refs
(NASA-TM-78130) Avail: NTIS HC A05/MF A01 CSCL 05B

A regional transfer activity contracts review held by the Earth Resources Office was summarized. Contracts in the earth resources field primarily directed toward applications of satellite data and technology in solution of state and regional problems were reviewed. A summary of the progress of each contract was given in order to share experiences of researchers across a seven state region. The region included Missouri, Kentucky, Tennessee, Mississippi, Alabama, Georgia, and North Carolina. Research in several earth science disciplines included forestry, limnology, water resources, land use, geology, and mathematical modeling. The use of computers for establishment of information retrieval systems was also emphasized. Author

N77-33579*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A SUMMARY OF THE TEST PROCEDURES AND OPERATIONAL DETAILS OF AN OCEAN DUMPING POLLUTION MONITORING EXPERIMENT CONDUCTED 7 OCTOBER 1976
Warren D. Hypes, J. W. Wallace, and E. A. Gurganus Aug. 1977 31 p refs
(NASA-TM-74066) Avail: NTIS HC A03/MF A01 CSCL 08B

A remote sensor experiment was conducted at a sewage sludge dump site off the Delaware/Maryland coast. Two aircraft serving as remote sensor platforms flew over the dump site during a sludge dump. One aircraft carried a multispectral scanner and the other aircraft carried a rapid scanning spectrometer. Data from sea-truth stations were collected concurrent with overpasses of the aircraft. All sensors were operational and produced good digital data. Author

N77-33580*# Old Dominion Univ., Norfolk, Va.
THE ROLE OF AEROSPACE TECHNOLOGY IN AGRICULTURE. THE 1977 SUMMER FACULTY FELLOWSHIP PROGRAM IN ENGINEERING SYSTEMS DESIGN
Sep. 1977 279 p refs Program held at Hampton, Va., 6 Jun. - 19 Aug. 1977; sponsored in part by Am. Soc. for Eng. Educ.
(Grant NGT-47-003-028)
(NASA-CR-145218) Avail: NTIS HC A13/MF A01 CSCL 02C

Possibilities were examined for improving agricultural productivity through the application of aerospace technology. An overview of agriculture and of the problems of feeding a growing world population are presented. The present state of agriculture, of plant and animal culture, and agri-business are reviewed. Also analyzed are the various systems for remote sensing, particularly

applications to agriculture. The report recommends additional research and technology in the areas of aerial application of chemicals, of remote sensing systems, of weather and climate investigations, and of air vehicle design. Also considered in detail are the social, legal, economic, and political results of intensification of technical applications to agriculture. Author

N77-33581*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
SENSOR PERFORMANCE REPORT, VOLUME 4 (S-190A) Final Report
R. A. Mendlowitz, Sr. and P. D. Lloyd Mar. 1975 132 p
(Contract NAS9-12200)
(NASA-CR-151528; LEC-5789) Avail: NTIS HC A07/MF A01 CSCL 14B

A summary of efforts expended to determine the radiometric accuracy and signal to noise ratio achieved by the S190A multispectral camera is reported. The technique used was to computer model the photographic system and to compare theoretical results to known or measured radiometric values. The two sources used as known targets for radiometric evaluation were the film broadband sensitometry and the lunar disc. From the analysis it appears feasible to attain an accuracy of 10% or better in radiometric accuracy. This however is contingent on contemporaneously exposing the target and spectral sensitometry. Author

N77-33582*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
S-191 SENSOR PERFORMANCE EVALUATION Final Report
C. L. Hughes Jun. 1975 76 p refs
(Contract NAS9-12200)
(NASA-CR-151527; LEC-5778) Avail: NTIS HC A05/MF A01 CSCL 14B

A final analysis was performed on the Skylab S-191 spectrometer data received from missions SL-2, SL-3, and SL-4. The repeatability and accuracy of the S-191 spectroradiometric internal calibration was determined by correlation to the output obtained from well-defined external targets. These included targets on the moon and earth as well as deep space. In addition, the accuracy of the S-191 short wavelength autocalibration was flight checked by correlation of the earth resources experimental package S-191 outputs and the Backup Unit S-191 outputs after viewing selected targets on the moon. Author

N77-33583*# Kanner (Leo) Associates, Redwood City, Calif.
SPACE STUDIES OF EARTH RESOURCES: METHODS AND MEANS OF MEASUREMENTS AND PROCESSING OF INFORMATION
Yu. K. Khodarev, ed., Ya. L. Ziman, ed., G. A. Avanesov, ed., Yu. M. Benilov, ed., A. A. Bolshoy, ed., V. V. Yegorov, ed., Yu. M. Shtarkov, ed., and Yu. M. Chesnokov, ed. Washington NASA Aug. 1977 441 p refs Transl. into ENGLISH of the book "Kosmicheskiye Issledovaniya Zemnykh Resursov: Metody i Sredstva Izmereniy i Obrabotki Informatsii" Moscow, Nauka Press, 1976 p 1-384
(Contract NASw-2790)
(NASA-TT-F-17544) Avail: NTIS HC A19/MF A01 CSCL 08F

Techniques used in aerial and space remote sensing of natural resources and the transmission and processing of such data are discussed. Methods for measuring terrestrial object radiation (reflected, solar, and its own) in the visible, infrared, and microwave frequencies are explored. Principles of space system design for studying natural resources are presented as well as the requirements for the devices and their orbits. Questions of international law and cooperation in relation to earth observation studies from space are considered. Author

N77-33584*# ECON, Inc., Princeton, N. J.
A COST BENEFIT EVALUATION OF THE LANDSAT FOLLOW-ON PROGRAM
15 Sep. 1976 135 p refs
(Contract NASw-2558)
(NASA-CR-155156; FR-76-102-3) Avail: NTIS HC A07/MF A01 CSCL 05C

Results are presented of a benefit and cost study for the LANDSAT Follow-on system with a thematic mapper. The analysis shows that the present worth of the benefits exceeds the present worth of the costs by a factor between 6.5 and 13 using a 10 percent discount rate and an infinite horizon for both. This study focuses only on major, demonstrated applications, conservatively evaluated. No benefits have been included except where a definite need for the information has been shown, a mechanism for disseminating the information has been defined, a technical capability has been demonstrated, and a defendable method of evaluating the economic worth has been developed. This approach has meant that certain applications with definite promise and substantial likely benefits could not be evaluated or assigned any benefits. Mention is made of these areas, however, either in the appropriate subject chapter or in the final chapter on non-quantified benefits. Author

N77-33585*# General Electric Co., Philadelphia, Pa.
A STUDY OF SELECTED ENVIRONMENTAL QUALITY REMOTE SENSORS FOR FREE FLYER MISSIONS LAUNCHED FROM THE SPACE SHUTTLE
Harold W. Goldstein and R. N. Grenda Aug. 1977 66 p refs
(Contract NAS1-13815)
(NASA-CR-145252; DOC-77SDS4246) Avail: NTIS HC A04/MF A01 CSCL 05B

The sensors were examined for adaptability to shuttle by reviewing pertinent information regarding sensor characteristics as they related to the shuttle and Multimission Modular Spacecraft environments. This included physical and electrical characteristics, data output and command requirements, attitude and orientation requirements, thermal and safety requirements, and adaptability and modification for space. The sensor requirements and characteristics were compared with the corresponding shuttle and Multimission Modular Spacecraft characteristics and capabilities. On this basis the adaptability and necessary modifications for each sensor were determined. A number of the sensors were examined in more detail and estimated cost for the modifications was provided. Author

N77-33586*# Texas A&M Univ., College Station. Remote Sensing Center.
FEASIBILITY STUDY OF MICROPROCESSOR SYSTEMS SUITABLE FOR USE IN DEVELOPING A REAL-TIME FOR THE 4.75 GHz SCATTEROMETER Final Report, 11 May - 10 Aug. 1977
10 Aug. 1977 56 p refs
(Contract NAS9-15311)
(NASA-CR-151522; RSC-3556-1) Avail: NTIS HC A04/MF A01 CSCL 09B

A class of signal processors suitable for the reduction of radar scatterometer data in real time was developed. The systems were applied to the reduction of single polarized 13.3 GHz scatterometer data and provided a real time output of radar scattering coefficient as a function of incident angle. It was proposed that a system for processing of C band radar data be constructed to support scatterometer system currently under development. The establishment of a feasible design approach to the development of this processor system utilizing microprocessor technology was emphasized. Author

N77-33587*# California Univ., Santa Barbara. Dept. of Geography.
EVALUATION OF OCEAN COLOR SCANNER (OCS) PHOTOGRAPHIC AND DIGITAL DATA: SANTA BARBARA CHANNEL TEST SITE, 29 OCTOBER 1975 OVERFLIGHT
Steven P. Kraus, John E. Estes, Michael R. Kronenberg, and Earl J. Hajic 18 Oct. 1977 54 p refs
(Grant NsG-5106)
(NASA-CR-155171) Avail: NTIS HC A04/MF A01 CSCL 20F

A summary of Ocean Color Scanner data was examined to evaluate detection and discrimination capabilities of the system for marine resources, oil pollution and man-made sea surface targets of opportunity in the Santa Barbara Channel. Assessment of the utility of OCS for the determination of sediment transport patterns along the coastal zone was a secondary goal. Data products provided 1975 overflight were in digital and analog formats. In evaluating the OCS data, automated and manual procedures were employed. A total of four channels of data in

digital format were analyzed, as well as three channels of color combined imagery, and four channels of black and white imagery. In addition, 1:120,000 scale color infrared imagery acquired simultaneously with the OCS data was provided for comparative analysis purposes. Author

N77-33588*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PRECISION SURVEYING USING VERY LONG BASELINE INTERFEROMETRY
J. W. Ryan, T. A. Clark, R. Coates, C. Ma (Md. Univ., College Park), D. S. Robertson (Natl. Geodetic Survey), B. E. Corey (MIT, Cambridge), C. C. Counselman (MIT, Cambridge), I. I. Shapiro (MIT, Cambridge), J. J. Wittels (MIT, Cambridge), and H. F. Hinteregger (NEROC Haystack Obs.) Sep. 1977 19 p Presented at Ann. Meeting of the Am. Soc. of Civil Engr., San Francisco, 17-21 Oct. 1977
(NASA-TM-X-71405; X-922-77-242) Avail: NTIS HC A02/MF A01 CSCL 08B

Radio interferometry measurements were used to measure the vector baselines between large microwave radio antennas. A 1.24 km baseline in Massachusetts between the 36 meter Haystack Observatory antenna and the 18 meter Westford antenna of Lincoln Laboratory was measured with 5 mm repeatability in 12 separate experiments. Preliminary results from measurements of the 3,928 km baseline between the Haystack antenna and the 40 meter antenna at the Owens Valley Radio Observatory in California are presented. Author

N77-33589*# Alabama Univ., University. Dept. of Geology and Geography.
APPLICATION OF REMOTE SENSING FOR PLANNING PURPOSES Final Report, May 1976 - Jul. 1977
Travis H. Hughes, ed. Jul. 1977 82 p refs Prepared in cooperation with The Geological Survey of Alabama
(Contract NAS8-31979)
(NASA-CR-150418) Avail: NTIS HC A05/MF A01 CSCL 05B

Types of remotely sensed data are many and varied, but all are primarily dependent on the sensor platform and the kind of sensing system used. A sensor platform is the type of aircraft or satellite to which a sensing system is attached; each platform has its own inherent advantages and disadvantages. Selected attributes of several current or recently used platforms are outlined. Though sensing systems are highly varied, they may be divided into various operational categories such as cameras, electromechanical scanners, and radars. Author

N77-33590*# North Carolina State Univ., Raleigh. Dept. of Geosciences.
APPLICATION OF SATELLITE REMOTE SENSING TO NORTH CAROLINA. DEVELOPMENT OF A MONITORING METHODOLOGY FOR TROPHIC STATES OF LAKES IN NORTH CAROLINA Final Report
Charles W. Welby and Robert E. Holman 1 Aug. 1977 118 p refs
(Contract NAS8-31984)
(NASA-CR-150419) Avail: NTIS HC A06/MF A01 CSCL 08H

Conjunctive study of four shallow coastal plain lakes in northeastern North Carolina and their LANDSAT-2 images demonstrates that it is possible to differentiate between the lakes and their respective trophic states on the basis of the multispectral scanner imagery. The year-long investigation established that monitoring of the trophic states of the lakes on a seasonal basis through application of color additive imagery enchancement techniques is possible. Utilizing a standard setting of the color additive viewer, an investigator can normalize the imagery to an internal standard of constant reflectance characteristics. By comparison of the false color renditions with a standard interference color chart combined with brightness measurements made on the viewer screen, one can relate the lake reflectances to their trophic states. Two or more bands of the imagery are required, and the present study established that for the lakes studied, Band 5 and Band 6 form a good combination. Author

N77-33591*# Computer Sciences Corp., Los Angeles, Calif.
EARTH RESOURCES TECHNOLOGY SYSTEM STANDALONE SOFTWARE PACKAGE: DESCRIPTION AND USER'S GUIDE
W. W. Chu 11 Sep. 1975 61 p refs
(Contract NAS5-11999)
(NASA-CR-152598; CSC/TM-75/6145) Avail: NTIS HC A04/MF A01 CSCL 09B

A user's guide and program description for the ERTS-B Stand-Alone Software Package is presented. This package was developed to compute the Keplerian elements at the descending node, the Brouwer Mean Elements at the node, the averaged Brouwer Mean Elements, and other orbital parameters for the orbits of the Earth Resources Technology Satellite (ERTS). The typical input for the program is an ephemeris file which resulted from a definitive orbit generated over a two day arc using the Cowell option in the Definitive Orbit Determination System (DODS) or the Goddard Trajectory Determination System (GTDS). Author

N77-33592# Oak Ridge National Lab., Tenn.
TEHM: A TERRESTRIAL ECOSYSTEM HYDROLOGY MODEL
D. D. Huff, R. J. Luxmoore, J. B. Mankin, and C. L. Begovich Apr. 1977 160 p refs
(Contract W-7405-eng-26; Contracts NSF INA-AG-199)
(EDFB-IBP-76-8; ORNL-NSF-EATC-27) Avail: NTIS HC A08/MF A01

The terrestrial ecosystem hydrology model (TEHM) which combines mechanistic models for climatic and hydrologic processes with vegetation properties is discussed. The model is able to explicitly simulate interception and throughfall; infiltration; root zone evaporation; transpiration, and drainage; plant and soil water potential; unsaturated and saturated subsurface flow; surface runoff; and open channel flow. It is also possible to use the TEHM with models for forest stand biomass dynamics and chemistry and exchange of heavy metals to study the transport and fate of trace contaminants at a watershed scale. Emphasis was placed on objective, physically based methods. When simulations of interception loss, soil moisture content, and base flow and storm flow were compared with observation, the overall adequacy of the model was assessed. For user convenience, the documentation includes a complete discussion of input formats, example data input sets, output summaries, and a microfiche listing of the complete source deck. ERA

N77-33593# Maryland Univ., College Park. Water Resources Research Center.
EFFECTS OF ECONOMIC DEVELOPMENT ON WATER RESOURCES
John H. Cumberland and Henry W. Herzog, Jr. Apr. 1977 66 p refs
(Contract DI-14-31-0001-5020; OWRT Proj. A-028-MD(1))
(PB-269096/4; W77-09051; TR-40) Avail: NTIS HC A04/MF A01 CSCL 13B

Methods were developed of extending traditional input-output models to account for the generation of residuals, and to trace the flows through treatment processes and environmental media. Specific technical gross residual coefficients were derived for the output of emissions from 92 types of economic activity into the Chesapeake Bay by 15 major river basins. GRA

N77-33594# General Accounting Office, Washington, D. C. Community and Economic Development Div.
PROBLEMS AFFECTING USEFULNESS OF THE NATIONAL WATER ASSESSMENT: WATER RESOURCES COUNCIL
23 Mar. 1977 24 p refs
(PB-269257/2; CED-77-50) Avail: NTIS HC A02/MF A01 CSCL 13B

An analytical mechanism is given for water appraising existing and proposed water and related land programs. With this program, the Council expects to be in a better position to make sound recommendations to the President and the Congress on allocating Federal resources to meet the Nation's critical water requirements. GRA

N77-33595# Oklahoma State Univ., Stillwater. Dept. of Agricultural Economics.

PREDICTING CHANGES IN LAND-USE PATTERNS RESULTING FROM WATER RESOURCE INVESTMENT USING A NONSTATIONARY MARKOV PROCESS Final Technical Report, 1 Jul. 1974 - 28 Feb. 1977
H. E. Drummond 1977 131 p refs
(Contract DI-14-31-0001-5105)
(PB-269409/9; W77-09268; OWRT-B-030-OKLA(1)) Avail: NTIS HC A07/MF A01 CSCL 13B

Changes in land use patterns in the immediate vicinity of Keystone and Pine Creek reservoir projects in eastern Oklahoma are evaluated using stationary and nonstationary Markov chain procedures. The objective of the procedure is to estimate the net or differential change in land use patterns caused by the development of the water resources development project. Pre-project growth patterns are extrapolated into the future to estimate what the land use pattern would have been if the project had not occurred. The difference between these estimates and observed land use patterns is the estimated net impact of the project. By evaluating both pre-project and post-project land use change patterns, it is possible to determine the future differential land use changes associated with the project development. GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N77-33596 Houston Univ., Tex.
AN ECONOMIC MODEL OF NEW CRUDE OIL AND NATURAL GAS SUPPLIES IN THE LOWER 48 STATES Ph.D. Thesis
Young Yuel Kim 1977 207 p
Avail: Univ. Microfilms Order No. 77-19565

An economic model is developed to show how reserve additions and economics of oil and gas will be affected by wellhead prices, tax provisions, finding rates, and drilling capacity availabilities. The range of reserve additions estimated by the model, where government pricing and taxing policies are varied, is much greater than the range of reserve additions estimated by the U.S. Geological Survey, where government pricing and taxing policies are not varied. Results of the model show how supplies of crude oil and natural gas from new resources in the lower 48 states and Texas will be affected by different price relationships, tax provisions, finding rates, and time horizons. High priority in future research should be given to extending the economic analysis for the lower 48 states to include the Alaskan and Offshore areas. Dissert. Abstr.

N77-33597 New York Univ., N. Y.
THE ECONOMIC DETERMINANTS OF WASTE OIL RECYCLING Ph.D. Thesis
Sonia P. Maltezou 1977 193 p
Avail: Univ. Microfilms Order No. 77-21300

Various government policy alternatives are examined to control the operation of the waste oil market. The objective of these policies in whatever form they are exercised, is to increase recovery, to increase the quantity of waste oil that is re-refined, and to reduce the quantity of waste oil that is burned under uncontrolled conditions. The analysis shows that many proposed policy alternatives intended to increase recycling could actually result in a reduction in quantities of waste oil that are recycled. This seeming anomaly results from the fact that many of the policies provide indirect incentives to increased recycling. It is concluded that only by providing direct incentives can policymakers be assured that increased waste oil recycling will be achieved. Dissert. Abstr.

N77-33598 California Univ., Riverside.
ENERGY IN AN OASIS: GEOTHERMAL RESOURCE DEVELOPMENT IN THE IMPERIAL VALLEY OF CALIFORNIA Ph.D. Thesis
Martin Joseph Pasqualetti 1975 422 p
Avail: Univ. Microfilms Order No. 77-20330

Attention is given to the Imperial Valley; best known as an agricultural oasis it is a large hot water geothermal resource as well. The difficulties of developing such a resource within a totally artificial yet highly profitable environment are discussed. Most obstacles to geothermal development are related to protection of the agricultural economy. The main concerns are for subsidence, induced seismicity, water supply, blowouts, the effect of air pollution on crops, and the possible socioeconomic changes in an established way of life. The Imperial Valley offers an abundant labor pool, huge nearby markets, transportation networks, a snow free climate, and energy which together constitute most of the important considerations in industrial location. Dissert. Abstr.

N77-33599# Committee on Energy and Natural Resources (U.S. Senate).
THE PRESIDENT'S ENERGY PROGRAM
Washington GPO 1977 176 p refs Compilation of documents for Comm. on Energy and Natural Resources
(GPO-88-556; Publ-9516)

Documents presented include: the President's address to the Nation on the energy problem, his speech on the National Energy Program before the joint session of Congress, the fact sheet on the President's program, the transcript of his news conference, and the text of the National Energy Plan. A.R.H.

N77-33600*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SOLAR POWER SATELLITE. CONCEPT EVALUATION. ACTIVITIES REPORT. VOLUME 2: DETAILED REPORT Progress Report, Jul. 1976 - Jun. 1977
Jun. 1977 1166 p refs
(NASA-TM-74942; JSC-12973-Vol-2) Avail: NTIS HC A99/MF A01 CSCL 10A

Comparative data are presented among various design approaches to thermal engine and photovoltaic SPS (Solar Power System) concepts, to provide criteria for selecting the most promising systems for more detailed definition. The major areas of the SPS system to be examined include solar cells, microwave power transmission, transportation, structure, rectenna, energy payback, resources, and environmental issues. Author

N77-33601*# Boeing Aerospace Co., Seattle, Wash. Electric Power Technology Div.
REVIEW OF ELECTROCHEMICAL IMPREGNATION FOR NICKEL CADMIUM CELLS
Sidney Gross Aug. 1977 116 p refs Prepared for JPL
(Contracts NAS7-100; JPL-953984)
(NASA-CR-155155) Avail: NTIS HC A06/MF A01 CSCL 10A

A method of loading active material within the electrodes of nickel cadmium cells is examined. The basic process of electrochemical impregnation of these electrodes is detailed, citing the principle that when current is applied reactions occur which remove hydrogen ions from solution, making the interior of the plaque less acidic. Electrodes result which are superior in energy density, stability, and life. The technology is reviewed and illustrated with typical performance data. Recommendations are made for additional research and development. Author

N77-33602*# Duke Univ., Durham, N. C. Dept. of Electrical Engineering.
USER'S MANUAL: COMPUTER-AIDED DESIGN PROGRAMS FOR INDUCTOR-ENERGY-STORAGE dc-TO-dc ELECTRONIC POWER CONVERTERS
Stephen Huffman 30 Jun. 1977 157 p refs
(Contract NAS5-22475)
(NASA-CR-152612; S-02) Avail: NTIS HC A08/MF A01 CSCL 10A

Detailed instructions on the use of two computer-aided-design programs for designing the energy storage inductor for single winding and two winding dc to dc converters are provided. Step

by step procedures are given to illustrate the formatting of user input data. The procedures are illustrated by eight sample design problems which include the user input and the computer program output. Author

N77-33603*# RCA Advanced Technology Labs., Camden, N. J. Government Systems Div.

DESIGN DEFINITION OF A MECHANICAL CAPACITOR Final Report, Jun. 1976 - Apr. 1977

T. D. Michaelis, E. W. Schlieban, and R. D. Scott May 1977 292 p refs

(Contract NAS5-23650)

(NASA-CR-152613) Avail: NTIS HC A13/MF A01 CSCL 10B

A design study and analyses of a 10 kW-hr, 15 kW mechanical capacitor system were studied. It was determined that magnetically supported wheels constructed of advanced composites have the potential for high energy density and high power density. Structural concepts are analyzed that yield the highest energy density of any structural design yet reported. Particular attention was paid to the problem of 'friction' caused by magnetic and I to the second power R losses in the suspension and motor-generator subsystems, and low design friction levels have been achieved. The potentially long shelf life of this system, and the absence of wearing parts, provide superior performance over conventional flywheels supported with mechanical bearings. Costs and economies of energy storage wheels were reviewed briefly. Author

N77-33604*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Control and Energy Conversion Div.

ELECTRICAL 2-OMEGA-cm 0.046-cm-THICK SILICON SOLAR CELLS AS A FUNCTION OF INTENSITY AND TEMPERATURE

P. A. Berman, T. F. Miyahara, and B. E. Anstaugh 15 Aug. 1977 37 p Revised

(Contract NAS7-100)

(NASA-CR-155166; JPL-Pub-77-27-Rev-1) Avail: NTIS HC A03/MF A01 CSCL 10A

Electrical characteristics of Mariner '71 type silicon solar cells are presented in graphical and tabular format as a function of intensity and temperature. Author

N77-33605*# General Electric Co., Wilmington, Mass. Aircraft Equipment Div.

SOLID POLYMER ELECTROLYTE (SPE) FUEL CELL TECHNOLOGY PROGRAM, PHASE 1/1A Final Report

17 Oct. 1975 92 p

(Contract NAS9-14345)

(NASA-CR-151506; TPR-015) Avail: NTIS HC A05/MF A01 CSCL 10A

A solid polymer electrolyte fuel cell was studied for the purpose of improving the characteristics of the technology. Several facets were evaluated, namely: (1) reduced fuel cell costs; (2) reduced fuel cell weight; (3) improved fuel cell efficiency; and (4) increased systems compatibility. Demonstrated advances were incorporated into a full scale hardware design. A single cell unit was fabricated. A substantial degree of success was demonstrated. Author

N77-33606*# General Electric Co., Wilmington, Mass. Aircraft Equipment Div.

SOLID POLYMER ELECTROLYTE (SPE) FUEL CELL TECHNOLOGY PROGRAM, PHASE 2/2A Final Report

15 Dec. 1976 96 p

(Contract NAS9-14345)

(NASA-CR-151507; TPR-028-4) Avail: NTIS HC A05/MF A01 CSCL 10A

Test evaluations were performed on a fabricated single solid polymer electrolyte cell unit. The cell operated at increased current density and at higher performance levels. This improved performance was obtained through a combination of increased temperature, increased reactant pressures, improved activation techniques and improved thermal control over the baseline cell configuration. The cell demonstrated a higher acid content membrane which resulted in increased performance. Reduced catalyst loading and low cost membrane development showed encouraging results. Author

N77-33607*# Hughes Aircraft Co., El Segundo, Calif. Space and Communications Group.

ATS-6 SOLAR CELL EXPERIMENT/IMPROVEMENT Final Report, 1 Jan. - 31 Dec. 1976

Lee J. Goldhammer 31 Jan. 1977 47 p refs

(Contract NAS5-22873)

(NASA-CR-152609) Avail: NTIS HC A03/MF A01 CSCL 10A

ATS 6 solar cell flight experiment data through 2 years of synchronous orbit operation are presented. Comparisons are made of the performances of the 13 different types of solar cell/cover configurations, including new cover processes and materials, and the COMSAT violet cell. These performances are also compared to the performances of the LES 6 solar cell experiment, the ATS 6 main solar arrays, and the Hughes Aircraft Company solar arrays, and to laboratory spectrum electron irradiations. It was found that the cells of the ATS 6 experiment generally performed as expected through 6 to 9 months in orbit, but that at 2 years they were more severely degraded than expected. Author

N77-33608*# Exxon Research and Engineering Co., Linden, N. J. Government Research Labs.

REDOX BULK ENERGY STORAGE SYSTEM STUDY, VOLUME 1 Final Report, 18 Feb. 1976 - 30 Jan. 1977

G. Ciprios, W. Erskine, Jr., and P. G. Grimes 10 Feb. 1977 200 p refs 2 Vol.

(Contract NAS3-19776)

(NASA-CR-135206-Vol-1; EXXON/GRU.1BH-77-Vol-1) Avail: NTIS HC A09/MF A01 CSCL 10B

Opportunities were found for electrochemical energy storage devices in the U.S. electric utility industry. Application requirements for these devices were defined, including techno-economic factors. A new device, the Redox storage battery was analyzed. The Redox battery features a decoupling of energy storage and power conversion functions. General computer methods were developed to simulate Redox system operations. These studies showed that the Redox system is potentially attractive if certain performance goals can be achieved. Pathways for reducing the cost of the Redox system were identified. Author

N77-33609*# Exxon Research and Engineering Co., Linden, N. J. Government Research Labs.

REDOX BULK ENERGY STORAGE SYSTEM STUDY, VOLUME 2 Final Report, 18 Feb. 1976 - 30 Jan. 1977

G. Ciprios, W. Erskine, Jr., and P. G. Grimes 10 Feb. 1977 549 p refs

(Contract NAS3-19776)

(NASA-CR-135206-Vol-2; EXXON/GRU.2BH.77-Vol-2) Avail: NTIS HC A23/MF A01 CSCL 10B

For abstract, see N77-33608.

N77-33610# RAND Corp., Santa Monica, Calif.

EUROPE'S CHANGING ENERGY RELATIONS

Horst Mendershausen Dec. 1976 121 p refs

(Contract DAHC15-67-C-0158)

(R-2086-ISA) Avail: NTIS HC A06/MF A01

In considering Western Europe's changing energy relations, the present study (1) projects likely changes during the decade ahead in the energy structures of OECD-Europe and, for comparison, the United States; (2) examines current developments now under way in the oil, natural gas, coal, and nuclear energy situations of the principal Western European countries; and (3) discusses international political, economic, and security issues related to these developments and to possible emergency disruptions of international oil supply. Author

N77-33611# Mallory (P. R.) and Co., Inc., Burlington, Mass. Lab. for Physical Science.

SEALED PRIMARY LITHIUM-INORGANIC ELECTROLYTE CELL Quarterly Report, 1 Sep. - 30 Nov. 1976

A. N. Dey Feb. 1977 45 p refs

(Contract DAAB07-74-C-0109)

(AD-A036172; ECOM-74-0109-11; QR-11) Avail: NTIS HC A03/MF A01 CSCL 10/3

The hermetic Li/SOCl2D cells presented an explosion hazard on abuse and a voltage delay problem after high temperature storage. The authors investigated both these problem areas

and made significant progress in both. The authors have been examining the Li anode film which causes the voltage-delay problem using SEM. They gathered data on the morphology and the rate of film growth as a function of various electrolyte variables such as LiAlCl4 concentration, additives such as S2Cl2, and SO2. Based on the available data a tentative model was proposed to describe the Li film growth process. It was found earlier that film growth rate could be reduced by reducing the LiAlCl4 concentration in the electrolyte. The LiCl film morphology can be changed dramatically by the addition of SO2. During the last quarter the authors evaluated the effect of the above electrolyte variables on the voltage-delay characteristics of the Li/SOCl2D cells. The authors found that the LiAlCl4 concentration affects both the voltage-delay and the intrinsic energy density of the Li/SOCl2D cells. The 1.0 and 0.5 (M) LiAlCl4-SOCl2 was the best from both the voltage-delay and the energy density stand points. GRA

N77-33612# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
INVESTIGATION OF GaAs SOLAR CELL POTENTIAL PERFORMANCE AND COST Final Report, Jun. 1975 - Dec. 1976
Cecil Stuerke Feb. 1977 23 p refs
(AD-A040736; AFAPL-TR-76-100) Avail: NTIS HC A02/MF A01 CSCL 10/2

This report describes the results of a study which investigated GaAs solar cell potential performance and cost. The study included a literature survey, analyses of cell performance, cost and weapon hardness, and limited cell testing. From the completed study came an Air Force interpretation of the present development of GaAs solar cells and an assessment of their potential performance and cost. GRA

N77-33613# Xerox Electro-Optical Systems, Pasadena, Calif.
THERMAL ENERGY STORAGE DEMONSTRATION UNIT FOR VUILLEUMIER CRYOGENIC COOLER Interim Report, 2 Jun. 1975 - 31 Aug. 1976
Robert Richter Feb. 1977 157 p
(Contract F33615-75-C-2045)
(AD-A040895; Rept-2340-I-1; AFAPL-TR-76-110) Avail: NTIS HC A08/MF A01 CSCL 10/2

This report covers the work performed under the Thermal Energy Storage Demonstration Unit Program. The report presents the analysis, design, fabrication, and testing of a thermal energy storage demonstration unit which was to be mated to an existing Vuilleumier cooler (AFLIR) to demonstrate the concept of powering such a device directly with stored thermal energy. The Thermal Energy Storage Demonstration Unit was to be sized for delivering 1000 watts thermal power for one hour at a temperature of 1250 + or - 25 F. The ternary eutectic 64 MgF2 - 30 LiF-6 KF, which has a eutectic temperature of 1310F, was selected as the thermal energy storage material. The report presents the approach and the assumptions underlying the design of the unit which incorporates a heat pipe for the transfer of energy from the thermal energy storage material to the hot cylinder of the Vuilleumier cooler. Details of the fabrication and the testing of the Thermal Energy Storage Demonstration Unit are presented. The analysis of the test data led to the conclusion that the basic design satisfied all requirements that were established for a TES unit. The thermal energy storage material, however, was found to apparently release its latent heat of fusion over a wider temperature range than had been anticipated. This fact can be attributed to nonisothermal phase transformation or a bulk thermal conductivity that is lower than had been assumed for the salt. Author (GRA)

N77-33614# National Bureau of Standards, Washington, D. C.
AN APPROACH FOR MANAGING AN ENERGY CONSERVATION PROGRAM Final Report, Dec. 1975 - Jan. 1977
Jan. 1977 61 p
(AD-A041086; NBSIR-77-1204; AFCEC-TR-77-11) Avail: NTIS HC A04/MF A01 CSCL 10/1

General and specific guidelines to be followed by USAF management personnel have been developed and tabulated in this report. These guidelines include, for example, establishing management structures to implement the detailed energy conservation programs, analyzing alternative energy conservation options for most of the Air Force Base facilities, family housing units, and special buildings. The guidelines are to be helpful for establishing and implementing short- and long-range plans for energy management, gaining support of all Base and tenant personnel, and monitoring program progress. Author (GRA)

N77-33615# Bechtel Corp., San Francisco, Calif.
COAL GASIFICATION STUDY Final Report
Apr. 1977 114 p refs
(Contract N68305-76-C-0009; ZF57571001)
(AD-A041860; EL-CR-77.013) Avail: NTIS HC A06/MF A01 CSCL 21/4

The general problem of providing fuel gas for Navy base facilities is studied. The intent is: first, to provide designs of a coal gasification plant producing 6x 10 to the 9th power Btu/day reactor output, based on two types of reactors; second, to conduct parametric studies leading to means for the costing of similar plants operating on different feedstocks; and third, to provide a method for estimating the change in boiler rating which must follow the substitution of fuel gas for either oil or coal firing. The performance and economics given are based on conceptual design methods. The economic results allow comparison of fuel-gas and fuel-oil costs on the basis of the Navy's method of analyzing costs using the 'Economic Analysis Handbook,' NAVFAC P-442, 1975. The costs are the sum of all future outlays discounted to the present but allowing escalation at different rates for utilities and feedstock over a 25-year production period. Author (GRA)

N77-33616# National Bureau of Standards, Washington, D. C.
TRANSPIRATION HEAT TRANSFER IN THERMAL ENERGY STORAGE DEVICES
B. A. Peavy and W. E. Dressler May 1977 32 p
(PB-267281/4; NBSIR-77-1237) Avail: NTIS HC A03/MF A01 CSCL 13A

Sensible heat transfer that takes place in a thermal storage device composed of a porous material with a fluid transpiring through it was investigated. Experiments were performed on a prototype thermal storage device and results were compared to numerical values computed from an analytical model. GRA

N77-33617# Institute for Defense Analyses, Arlington, Va. Science and technology Div.
DoD ENERGY R AND D. PART 2: MILITARY FUEL OPERATIONS. PERFORMANCE AND R AND D IMPLICATIONS Final Report, Apr. 1975 - Sep. 1976
F. R. Riddell, R. C. Oliver, and R. E. Reichenbach Mar. 1977 104 p refs
(Contract DAHC15-73-C-0200)
(AD-A042272; P-1116-Pt-2) Avail: NTIS HC A06/MF A01 CSCL 21/4

The questions addressed and the conclusions reached in this study are: (1) What range of multifuel capability may be desirable in military engines to relieve possible fuel supply problems. The conclusion is that it would be advantageous for military aircraft to be able to use all types of jet fuels and for ground vehicles and ships to be able to use all types of diesel fuels as safeguards against short-term shortages of military specification fuels. (2) What liquid hydrocarbon fuel options may be considered without incurring major performance degradation or severe maintenance problems. The conclusion is that with appropriate modifications to fuel supply and starting systems, the range of fuels defined in (1) could be used. However, R and D is needed to determine exactly what modifications are required and how fuels may be field-tested. More R and D is also needed to assemble handbooks of information on operating envelope and maintenance changes that may result from use of off-specification fuels. Current information is far from complete. Fuels from syncrudes should be included in this R and D work. (3) In the long-term, what alternatives to liquid hydrocarbon fuels can be considered. In the long-term (beyond 2000) the only possibilities appear to be (a) more extensive use of nuclear power in Navy ships and (b) use of liquid hydrogen in long-range aircraft. For all land and air tactical combat vehicles, however, any change from liquid hydrocarbon fuels would involve major performance changes which are probably unacceptable. Author (GRA)

N77-33618# AIA Research Corp., Washington, D. C.
EARLY USE OF SOLAR ENERGY IN BUILDINGS. A STUDY OF BARRIERS AND INCENTIVES TO THE WIDESPREAD USE OF SOLAR HEATING AND COOLING SYSTEMS
Aug. 1976 195 p
(Grant NSF APR-75-18339)
(PB-267832/4; NSF/RA-760578) Avail: NTIS HC A09/MF A01 CSCL 13A

The principal findings, the methodology, and the results of a national survey of the early users of the technology are outlined. The results of life cycle cost analyses of fifteen selected solar heating projects, as well a general overview of the various economic factors relating to the commercialization of solar technology are presented. A regulatory analysis of sun rights and land use, building codes, warranties of performance, rights to energy, and the implications of these rights are also described. GRA

N77-33619# Martin Marietta Corp., Baltimore, Md.
BIOLOGICAL SOLAR ENERGY CONVERSION: APPROACHES TO OVERCOME YIELD, STABILITY AND PRODUCT LIMITATIONS Progress Report, 1 Oct. 1976 - 31 Mar. 1977
Bessel Kok, C. F. Fowler, H. H. Hardt, and R. J. Radmer Mar. 1977 28 p refs
(Grant NSF AER-73-03291)
(PB-267937/1; MML-TR-77-27c; PR-4; NSF/RA-770063) Avail: NTIS HC A03/MF A01 CSCL 06A

The chloroplast aging and rate limitations in the photosynthetic electron transport system were studied. It was confirmed that the photosystem II acceptor, phenylenediamine, accepts electrons from two sites in the electron transport chain, one of which is uncoupler insensitive. These two sites have approximately equal rate constants and contribute about equally when photochemistry operates with maximum rates. Therefore, it was concluded that when uncoupler is present, the primary rate limitation precedes the uncoupler-insensitive transport to phenylenediamine. Fluorescence measurements have confirmed the results showing that chloroplast storage at high pH inhibits only the oxygen evolution system and not the functioning of the trap. GRA

N77-33620# New Mexico Univ., Albuquerque. Dept. of Economics.
SOLAR ENERGY: POLICY AND PROSPECTS
William D. Schulze, Shaul Ben-David, Roberta Katson, Scott Noll, and Fred Roach Jul. 1976 187 p
(Grant NSF APR-75-18249)
(PB-267986/8; NSF/RA-760577) Avail: NTIS HC A09/MF A01 CSCL 13A

The economic feasibility of near-term solar energy sources, decontrolled energy prices for the United States on a state-by-state basis, near-term feasibility for solar residential space heating, for the full application of solar energy to a mixed load community in the Southwest, and application of solar process heat to industry are analyzed. GRA

N77-33621# Pennsylvania Dept. of Community Affairs, Harrisburg.
RECLAMATION OF ENERGY FROM SOLID WASTE: THEORY AND PRACTICE. A SELECTED, ANNOTATED BIBLIOGRAPHY FOR PENNSYLVANIA LOCAL GOVERNMENT OFFICIALS
Nov. 1976 33 p
(PB-267800/1) Avail: NTIS HC A03/MF A01 CSCL 10A

Methods of reclaiming energy from solid waste are considered as possible solutions to community solid waste disposal problems. GRA

N77-33622# Boeing Co., Seattle, Wash.
ADVANCED THERMAL ENERGY STORAGE (TES) SYSTEMS Interim Summary Report
Nov. 1976 35 p refs
(Proj. 788-1)
(EPRI-EM-256-SY) Avail: NTIS HC A03/MF A01

Research in high temperature gas cooled central receivers for solar energy and for receiver conceptual design of energy storage systems compatible with higher temperature gas turbine systems was examined. The technical feasibility of high temperature thermal energy storage was studied in detail. The two advanced systems are a phase change energy storage with inorganic salts and a reversible thermochemical reaction energy storage system. A third system, a sensible heat pebble bed energy storage system was investigated as a near term benchmark. The phase change concept offers the most economic incentive primarily as a result of its high storage density. Major technical barriers involve storage media and container material compatibility testing. The thermo-chemical concept is the most attractive from a plant control flexibility standpoint. The major technical uncertainty is the required catalytic SO3 dissociation reactor. ERA

N77-33623# Science Applications, Inc., La Jolla, Calif. Fluid Mechanics Div.
NEARFIELD FLOW FOR AN OCEAN THERMAL POWER PLANT. PART 3: MANUAL FOR THE COMPUTER CODE NRFL02 Fluid Mechanics Div.
Glyn O. Roberts, Steve A. Piacsek (NRL, Wash., D. C.), and Juri Toomre (NRL, Wash., D. C.) 1976 52 p refs
(Contract E(49-26)-1005)
(DSE/1005-7; NRL-GFD/OTEC-7-76-Pt-3) Avail: NTIS HC A04/MF A01

A user's manual for the computer code NRFL 02 is presented which has been developed to calculate the near field stratified turbulent flow driven by the intakes and outflows of an ocean thermal power plant. The code uses a two dimensional geometry and a four parameter first order turbulence closure model. Sophisticated numerical methods enable convergent and accurate solutions to be obtained rapidly and economically. A large and feasible printer output package provides for the display and interpretation of the results. ERA

N77-33624# Naval Research Lab., Washington, D. C.
GEOPHYSICAL FLUID DYNAMICS BACKGROUND FOR OCEAN THERMAL POWER PLANTS
S. A. Piacsek, J. Toomre, and G. O. Roberts (Science Applications, Inc., La Jolla, Calif.) 1976 67 p refs
(Contract E(49-26)-1005)
(DSE/1005-1; NRL-GFD/OTEC-11-75) Avail: NTIS HC A04/MF A01

Background material and brief assessments in several areas of geophysical fluid dynamics (GFD) which bear directly on problems of the ocean thermal power plant operation are provided. Relevant GFD research areas discussed include: turbulence and thermal wakes; ocean circulation and the permanent thermocline; air/sea interaction and thermocline variation; weather and climate modeling; and marine ecosystems. The relationships of each GFD area to specific ocean thermal power plant problems are illustrated and multiple disciplines in GFD that must be considered are emphasized. ERA

N77-33625# Lamont-Doherty Geological Observatory, Palisades, N. Y.
MARINE PASTURES: A BY-PRODUCT OF LARGE (100 MEGAWATT OR LARGER) FLOATING OCEAN-THERMAL POWER PLANTS Final Report
S. Laurence and O. A. Roels 31 Aug. 1976 225 p
(Contract EY-76-S-02-2581)
(COO-2581-3) Avail: NTIS HC A10/MF A01

The potential biological productivity of an open-sea mariculture system utilizing the deep-sea water discharged from an ocean-thermal energy conversion (OTEC) plant was investigated. In a series of land-based studies, surface water was used to inoculate deep water and the primary production of the resultant blooms was investigated. Each cubic meter of deep water can produce approximately 2.34 g of phytoplankton protein, and an OTEC plant discharge deep water at a rate of 4.5 x 10 to the fourth power cu m min to the -1 power could produce 53 x 10 to the seventh power kg of phytoplankton protein per 350-day year. A series of land-based shellfish studies indicated that, when fed at a constant rate of 1.83 x 10 to the 3 power g of protein per second per 70-140 g of whole wet weight, the clam, Tapes japonica, could convert the phytoplankton protein-nitrogen into shellfish meat protein-nitrogen with an efficiency of about 33 per cent. Various factors affecting the feasibility of open-sea mariculture are dicussed. ERA

N77-33628# Franklin Inst. Research Labs., Philadelphia, Pa.
TECHNICAL AND ECONOMIC FEASIBILITY OF SOLAR AUGMENTATION FOR BOILER FEEDWATER HEATING IN STEAM-ELECTRIC POWER PLANTS
Nov. 1976 94 p refs
(Contract EY-76-C-02-2864)
(COO-2864-1; F-C4362) Avail: NTIS HC A05/MF A01

Results of a study on the technical and economic feasibility of augmenting heating of boiler feedwater in steam elsctric power plants by solar energy are presented. The possibility of retrofitting existing oil or gas fired steam plants with solar collection systems was investigated. The use of four solar collectors in connection with different methods of single degree of freedom sun following motions was examined. For all collectors, daily sun following without seasonal adjustment of tilt was found to be cost-effective. Conclusions indicate solar augmentation of boiler feedwater heating does not constitute a cost-effective method of fossil fuel conservation. ERA

N77-33627# Illinois Univ., Urbana. Dept. of Civil Engineering.
BIOLOGICAL CONVERSION OF BIOMASS TO METHANE Quarterly Progress Report, 1 Sep. - 30 Nov. 1976
J. T. Pfeffer Dec. 1976 14 p
(Contract EY-76-S-02-2917)
(COO-2917-76-2) Avail: NTIS HC A02/MF A01

Manure fermentation processes are described to produce methane from biomass. The study relating to the effect of reactor design is underway, but the results are too preliminary to evaluate. ERA

N77-33629# Maine Univ., Orono. Coll. of Engineering and Science.
PROCEEDINGS OF THE ERDA SEMIANNUAL SOLAR PHOTOVOLTAIC PROGRAM REVIEW MEETING
1976 488 p Meeting held at Orono, Maine, 3-6 Aug. 1976
(Contract E(49-18)-2477)
(CONF-760837-P2) Avail: NTIS HC A21/MF A01

Separate abstracts were prepared for 28 papers presented on solar photovoltaic systems. Topics covered include conceptual design and systems analysis for solar photovoltaic systems, GaAs materials and devices, semiconductors, and polycrystalline silicon materials and devices. Also discussed were concentration systems and low cost silicon solar arrays. ERA

N77-33629# Sandia Labs., Albuquerque, N. Mex.
SANDIA LABORATORIES ENERGY PROGRAMS
C. D. Lundergan, ed., P. L. Meady, ed., and R. S. Gillespie, ed.
Mar. 1977 55 p
(Contract EY-76-C-04-0789)
(SAND-77-0034) Avail: NTIS HC A04/MF A01

An overview is provided of energy programs being conducted in the development of economical and environmentally acceptable alternative energy sources. About 75 percent of the resources of this laboratory are applied to research and development for national security programs having to do primarily with nuclear weapons. The remaining 25 percent are applied to energy programs and energy-related activities, particularly those raquiring resources that are also used in nuclear weapon and other national security programs. Examples of such energy programs and activities are research into nuclear fusion, protection of nuclear materials from theft or diversion, and the disposal of radioactive waste. Instruments developed to detect, measure, and record the detonation of nuclear devices underground are now being used to support the development of in-situ processing of coal and oil shale. ERA

N77-33630# Energy Research and Development Administration, Washington, D. C.
PUBLIC ACCEPTANCE OF NUCLEAR POWER
James L. Liverman 1977 16 p refs Presented at Intern. Conf. on Nucl. Power and its Fuel Cycles, Salzburg (Austria)
(IAEA-CN-36/507; Conf-770505-79) Avail: NTIS HC A02/MF A01

A number of actions have been taken in the United States to prevent and to delay installation and development of nuclear technology. These actions are reviewed and analyzed with emphasis on the 1976 California nuclear moratorium referendum and other more recent actions at state and national levels. They are compared with the status and outcome of similar actions in other nations as is possible. Additionally, ERDA's current approaches to public involvement in the decision making process is discussed, including the value of comprehensive analyses of health, environmental, and socioeconomic aspects of alternative energy sources in responding to public needs. U.S. plans for providing such analyses for all installed and developing energy technologies are presented with special reference to areas which require international cooperation for implementation. The value of international analysis and internationally accepted environmental control strategies for all energy technologies is also addressed. ERA

N77-33631# TRW Systems Group, McLean, Va.
CONSUMER THERMAL ENERGY STORAGE COSTS FOR RESIDENTIAL HOT WATER, SPACE HEATING AND SPACE COOLING SYSTEMS
30 Nov. 1976 47 p refs
(Contract W-31-109-eng-38)
(ANL-X-76-3364-1) Avail: NTIS HC A03/MF A01

The cost of household thermal energy storage (TES) in four utility service areas that are representative for hot water, space heating, and space cooling systems in the United States is presented. A technology characterization of commercially available and developmental/conceptual TES systems is given. Consumer cost of the three TES systems is then evaluated, based on typical designs in four utility service areas. ERA

N77-33632# ACE-Federal Reporters, Inc., Washington, D. C.
ENERGY TECHNOLOGIES FOR THE WEST: POSSIBLE EFFECTS OF ENERGY TECHNOLOGY ON LAND, WATER, AND AIR RESOURCES
1976 81 p Workshop held at San Francisco, 21 Sep. 1976
Sponsored by ERDA
(TID-27444) Avail: NTIS HC A05/MF A01

By the year 2000, a water deficiency of about 2,250,000 acre-feet will exist in California; therefore, many agencies will not indefinitely commit supplies of fresh water for power plant cooling. Legislation for siting power plants along the coastline is summarized. A report is given on a program to investigage the energy required to develop water, or in short, to move water to where it is to be used; water which may be associated with the use and conservation of water; the energy associated with waste-water treatment; and waste-water reuse. The potential of geothermal resources is reviewed. It is believed the Lake County government can, with the state and Federal government, plan geothermal development. It is also believed the Geysers should be considered as a payoff area. An extensive question and answer session completed the workshop. ERA

N77-33633# Argonne National Lab., Ill. Chemical Engineering Div.
INSTRUMENTATION FOR AUTOMATIC CYCLING OF LITHIUM-ALUMINUM/IRON SULFIDE SECONDARY CELLS
W. F. Olsen and M. A. Slawecki Dec. 1976 15 p refs
(Contract W-31-109-eng-38)
(ANL-76-119) Avail: NTIS HC A02/MF A01

The system described provides the capability for control of cell cycling and recording of data without the need for constant attendance by research personnel. Electrical performance, power, energy storage capacity cyclelife and cell lifetimes are determined by repetitive charging and discharging of the cells. ERA

N77-33634# Westinghouse Electric Corp., Pittsburgh, Pa.
STUDY OF THE AUXILIARIES FOR LEAD-ACID BATTERY SYSTEMS FOR PEAKING POWER Final Report, period ending Oct. 1976
Dec. 1976 274 p refs
(Contracts EX-76-C-01-2114; E(49-18)-2114)
(CONS/2114-3) Avail: NTIS HC A12/MF A01

Areas addressed are hardware sharing with the power converter gear, system reliability, impact of cooling and ventilation systems, effects of system rating on auxiliaries costs, and the effects of advances of technology in monitoring and protection devices with the use of large-capacity cells. It was found that the most economic choice for a 10-MW, 40-MWh peaking power

battery system using 5-kWh cells consists of a 1620 Vdc, 10-string design. The total cost per kW was found to be a steadily decreasing function of system rating; it was $325/kW at a 10 MW rating. Water cooling of the battery is the most economic choice for virtually every climate. ERA

N77-33635# Yardney Electric Corp., Pawcatuck, Conn.
DESIGN AND COST STUDY OF A ZINC/NICKEL OXIDE BATTERY FOR ELECTRIC VEHICLE PROPULSION Final Report
Oct. 1976 118 p refs
(Contract W-31-109-eng-38)
(ANL-K-76-3543-1; Rept-2033-76) Avail: NTIS HC A06/MF A01

A preliminary design and cost study of a zinc/nickel oxide battery suitable for electric vehicle propulsion was conducted. A state-of-technology four-cell zinc/nickel oxide battery module is specified having the following principal characteristics: Capacity (C/2 rate), 310 Ah; Voltage, 6.4 V; Total energy content (C/2 rate), 1.98 kWh; Weight, 26.4 kg; Specific energy (C/2 rate), 75 Wh/kg; Specific power (sustaining; peak), 68 W/kg; 250 W/kg; Cycle life (60 percent depth at C/2 rate), 500. Battery manufacturing processes and costs are defined for initial pilot production of the state-of-technology zinc/nickel oxide battery. Production of the advanced technology battery in a highly automated dedicated facility is then defined for plant capacity. Preliminary test procedures and standards for cells and batteries are defined including evaluation of basic performance, environmental effects and safety, by means of a comprehensive test matrix. ERA

N77-33636# United Technologies Research Center, East Hartford, Conn.
PRELIMINARY FEASIBILITY EVALUATION OF COMPRESSED AIR STORAGE POWER SYSTEMS, VOLUME 1 Final Report, Jun. 1975 - Dec. 1976
Dec. 1976 318 p refs Sponsored in part by ERDA 2 Vol.
(Grant NSF AER-74-00242)
(CONS/NSF/42-1) Avail: NTIS HC A14/MF A01

A preliminary technical, economic, and environmental feasibility evaluation of generating peak power with a compressed air power system incorporating a modified state-of-the-art gas turbine and an hydraulically compensated, mined, hard rock cavern was conducted. Results are presented covering the siting potential and economics for hard rock storage caverns, the types of aboveground equipment which could be used with suitable modifications, system performance and economics, and the potential for electric utility application. The technical approach was based on technology currently available, although in some cases not yet reduced to commercial practice. ERA

N77-33637# Atomics International, Canoga Park, Calif.
SUBSEA NUCLEAR POWER GENERATING STATIONS FOR OFFSHORE OIL PRODUCTION OPERATIONS. PRELIMINARY SAFETY AND LICENSING INFORMATION DOCUMENT
15 Feb. 1977 48 p refs
(Contract EY-76-C-03-0701)
(AI-ERDA-13193) Avail: NTIS HC A03/MF A01

Preliminary safety and licensing information is presented relating to the manufacture, installation, and operation of small subsea nuclear generating stations in remote offshore locations, and the associated onshore base-site activities of reactor refueling and system refurbishment at four-year intervals. The purpose of the proposed facilities is to provide a subsea power capability for offshore oil production operations in areas where surface conditions, water depths, or other environmental constraints may preclude the use of surface mounted power sources. This will provide the capability to achieve the maximum recovery of petroleum resources from the U.S. frontier areas. Summary descriptions of a typical subsea nuclear generating station and a typical base site-facility are presented. General safety and licensing considerations are discussed, and a representative schedule of licensing activities is outlined. ERA

N77-33638# Brookhaven National Lab., Upton, N. Y.
ROLE OF RENEWABLE ENERGY TECHNOLOGIES IN DEVELOPING COUNTRIES
P. F. Palmedo 10 Jan. 1977 11 p refs
(Contract EY-76-C-02-0016)
(BNL-22311) Avail: NTIS HC A02/MF A01

Some of the implications of the choice between renewable, decentralized technologies and nonrenewable, centralized technologies as applied to developing countries are presented. In order to clarify the significance of the distinction between renewable and depletable resources, two qualifications are made. The resource and its feasible system to use that resource is of primary interest. The second qualification is that some resources that are finite have such large abundance that they can be considered renewable. Some specific steps that can be taken to give renewable energy resources an opportunity to compete on a more equal footing with conventional fossil and nuclear technologies are: stimulate and support energy planning in developing countries; include appropriate technology in developed country R and D programs; and develop and demonstrate technologies. ERA

N77-33639# California Univ., Livermore. Lawrence Livermore Lab.
US ENERGY FLOW IN 1976
William J. Ramsey 24 Mar. 1977 8 p
(Contract W-7405-eng-48)
(UCID-17443) Avail: NTIS HC A02/MF A01

An energy flow diagram for the U.S. for 1976 is presented, and one for 1975 is included for comparison. Some significant differences between 1975 and 1976 are: total energy use increased 4.8 percent, almost reaching the record use of 1973; oil imports increased significantly to 15.5 quads, more than 20 percent above 1975, and almost 44 percent of our total oil use; coal and natural gas remained more or less constant; the industrial sector was unique in that its energy use decreased somewhat due to conservation efforts; delivered nuclear power increased by 10.9 percent and a trend toward electrification continued with distributed electrical energy increasing by 6.1 percent. ERA

N77-33640# California Univ., Berkeley. Lawrence Berkeley Lab.
ANALYSIS OF THE CALIFORNIA ENERGY INDUSTRY
J. Sathaye, H. Ruderman, R. Sextro, P. Benenson, L. Kunin, P. Chan, J. Kooser, Y. Bendov, B. Green, and R. Clear Jan. 1977 169 p refs
(Contract W-7405-eng-48)
(LBL-5928) Avail: NTIS HC A08/MF A01

Energy policy is discussed in relation to the energy supply system for California, an integral part of the state's economy. Some of the questions to be addressed are if the energy system is to expand, by how much, and in what particular areas of supply; what are the policy ramifications of certain changes as opposed to others; and what are the major economic effects of changes in energy supply system plans. The California energy industry and its relationship to the California and U.S. economies is described. The analytic capability for determining the direct and indirect employment and income impacts resulting from a given energy future for California is provided. Methodology with scenarios that embody varying combinations of conventional energy technologies, new energy technologies and energy conservation measures is described and tested. ERA

N77-33641# Oak Ridge National Lab., Tenn.
DESIGN REPORT FOR THE ACES DEMONSTRATION HOUSE
E. C. Hise, J. C. Moyers, and H. C. Fisher Oct. 1976 50 p refs
(Contract W-7405-eng-26)
(ORNL-CON-1) Avail: NTIS HC A03/MF A01

A 2000 sq ft single family residence was constructed in the first quarter of 1976. The structure was built to demonstrate energy conserving features of additional insulation, the annual cycle energy system (ACES), and an automatic economy cycle in the cooling season. Design specifications for the house and for the ACES components are given. ACES is a water to air heat pump system with ice and thermal storage. Calculated loads and predicted performance of the system along with the calculated performance of conventional systems are presented. Design calculations indicate that ACES can supply space heating, space

cooling, and domestic hot water for about 42% of the electrical consumption required by a system composed of an electric furnace, electric air conditioner, and an electric water heater and for about 54% of the electrical consumption of an air to air heat pump and an electric water heater. ERA

N77-33642# Energy Research and Development Administration, Washington, D. C.
OCEAN THERMAL ENERGY CONVERSION (OTEC) PROGRAM SUMMARY
Oct. 1976 102 p refs
(ERDA-76-142) Avail: NTIS HC A06/MF A01

Forthcoming activities in the OTEC program are summarized, along with funding for fiscal years 1972 through 1976. OTEC projects that are presently being funded by federal agencies, or that are already completed but still of current interest, are also discussed. ERA

N77-33643# Exxon Enterprises, Inc., New York.
APPLICATION OF THE ALSTHOM/EXXON ALKALINE FUEL CELL SYSTEM TO UTILITY POWER GENERATION Final Report
E. R. Elzinga, J. G. Bannochie, R. J. Bellows, J. H. Correa, H. H. Horowitz, and C. W. Snyder Jan. 1977 247 p refs
(EPRI-EM-384) Avail: NTIS HC A11/MF A01

An evaluation of Alsthom/Exxon alkaline fuel cell technology was made for application to utility power generation. It was determined how close the technology could come to EPRI efficiency, investment, and related targets. The program consisted primarily of a systems analysis to explore the effect of major variables such as fuel cell operating temperature, fuel type and degree of carbon oxides preremoval on efficiency and cost. Most of the effect centered around minimizing cost and heat rate by selecting the most appropriate process techniques and by heat integrating the various parts of the process. ERA

N77-33644# Oak Ridge National Lab., Tenn. Energy Div.
IMPROVED ENGINEERING-ECONOMIC MODEL OF RESIDENTIAL ENERGY USE
Eric Hirst, Jane Cope, Steve Cohn, William Lin, and Robert Hoskins Apr. 1977 68 p refs Sponsored in part by Federal Energy Admin.
(Contract W-7405-eng-26)
(ORNL-CON-8) Avail: NTIS HC A04/MF A01

An improved version of the ORNL residential energy use model was developed to simulate energy use in the residential sector from 1970 through 2000. The model provides considerable detail on annaul energy uses by fuel, end use, and housing type; and also estimates annual equipment installations and ownership, equipment energy requirements, structural thermal integrities, fuel expenditures, equipment costs, and costs for improving thermal integrities on new and existing housing units. Thus, the model provides considerable detail on residential energy uses and associated costs. These details are useful for evaluating alternative energy conservation policies, programs, and technologies for their energy and economic effects during the next quarter century. ERA

N77-33645# Michigan Technological Univ., Houghton.
ENERGY AND PROTEIN PRODUCTION FROM PULP MILL WASTES Progress Report, 15 Sep. - 15 Dec. 1976
M. F. Jurgensen and J. T. Patton 15 Dec. 1976 8 p refs
(Contract EY-76-S-02-2983)
(COO-2983-2) Avail: NTIS HC A02/MF A01

Significant progress was made in establishing the operability and reliability of major pieces of equipment needed for the production of protein and methane from spent sulfite liquor (SSL). Batch ozonations of SSL were conducted at times varying from 1 to 6 hours at pH's in the range of 10 to 2. These screening experiments consistently indicate that low pH's favor the breakdown of SSL into organic fragments which are more easily assimilated by microorganisms. Approximately 23% of the organics oxidized at all pH levels indicated that pH has no effect on the total oxidation of SSL. Total sulfur content of SSL was not measurably altered by ozonation. The intense brown color of SSL was appreciably removed during ozonation. The contents of the reactor assumed a light brownish-yellow hue during the course of a 4 hour ozonation treatment. ERA

N77-33646# Los Alamos Scientific Lab., N. Mex.
ACCOUNTING SYSTEMS FOR ENERGY CONSERVATION
R. J. Barrett and M. Becker Nov. 1976 10 p refs
(Contract W-7405-eng-36)
(LA-6569-MS) Avail: NTIS HC A02/MF A01

It was found that existing methods of accounting for energy consumption are not well suited to the analysis of energy conservation programs. A thorough discussion is presented of what the characteristics of an energy conservation data base ought to be. A data base (GADFLY) is suggested, which would be designed for analysis of conservation policies. Using New Mexico as an example, the difference between GADFLY and the Federal Energy Administration's STRAWMAN data base is detailed. ERA

N77-33647# California Univ., Berkeley. Lawrence Berkeley Lab.
PROMOTING ENERGY CONSERVATION THROUGH OCCUPATIONAL LICENSURE: A FEASIBILITY STUDY
W. W. Wilms Mar. 1977 21 p refs
(Contract W-7405-eng-48)
(LBL-5996) Avail: NTIS HC A02/MF A01

It was assumed that if candidates were tested on their knowledge of energy conservation, training institutions (colleges and universities) and publishers would institutionalize energy conservation in their curricula and publications to prepare candidates for the examinations, which would achieve a long-term structural change. Topics studied include: approximately five licensed occupations, which because of their size or function, can promote energy conservation; the extent to which energy conservation is already part of the licensing process; the feasibility of amending the licensing procedure in those occupations to highlight energy conservation; and strategies to bring energy conservation into the licensing process. Seventeen boards were initially identified to have an impact on energy conservation, but were narrowed to these five areas: architecture, engineers, contractors, landscape architecture, and accounting. ERA

N77-33648# Energy Research and Development Administration, Washington, D. C.
PROGRAM PLAN FOR ERDA'S PARTICIPATION IN THE IEA WORKING PARTY ON ENERGY CONSERVATION RESEARCH AND DEVELOPMENT
Feb. 1977 118 p
(ERDA-77-57) Avail: NTIS HC A06/MF A01

The Fiscal Year 1977 program plan for ERDA's participation in the Working Party on Energy Conservation research and development is presented. The purposes of this program plan are to: (1) provide guidelines for United States participation in the Working-Party program for use by ERDA and other Federal agencies interested in cosponsoring research and development activities; (2) identify the Working-Party project areas in which ERDA and other Federal agencies are presently participating, specifying financial commitments; and (3) identify the Working-Party project areas in which ERDA and other Federal agencies are planning to participate, specifying financial commitments. The plan outlines specific goals and criteria for United States participation in the Working Party, and presents the current and planned participation of ERDA and other Federal agencies. ERA

N77-33649# Argonne National Lab., Ill.
STRATEGIES FOR COMMERCIALIZING CUSTOMER THERMAL-ENERGY STORAGE
S. H. Nelson Dec. 1976 80 p refs
(Contract W-31-109-eng-38)
(ANL-ES-55) Avail: NTIS HC A05/MF A01

Strategies for commercializing customer thermal storage are presented. Storage techniques evaluated are space heating, air conditioning, hot water heating, and interruptible hot water heating. Storage systems involved store off peak electric energy for thermal applications during peak load hours. Analyses of both storage techniques and principal parties affected by storage indicate four barriers: the absence of commercially available air conditioning storage devices, appropriate rates, information on both rates and devices, and widespread utility support. Development of appropriate rates is the key to commercialization. The criteria used to evaluate rate types are maximum combined utility and customer benefits, ease of commercialization, and practical

feasibility. Rate types include demand charges, time of use rates, and two forms of load management rates; and the possibility of utility ownership is considered. ERA

N77-33650# Institute of Gas Technology, Chicago, Ill.
EXPERIMENTAL PROGRAM FOR THE DEVELOPMENT OF PEAT GASIFICATION Interim Report, 10 Feb. - 30 Jun. 1976
30 Jun. 1976 21 p
(Contract E(49-18)-2469)
(FE-2469-3; IR-1) Avail: NTIS HC A02/MF A01

The physical structure and chemical composition of peat were studied and found to be significantly different from those of coal. It was found that drying and grinding peat decreases its liquid absorption capacity. Toluence was the least absorbed, of fire potential slurry media, followed by acetone, propanol, ethanol, and water. Results show that the total liquid absorbed was only slightly less when it was first soaked briefly in water and then in toluene than in the reverse order. Slurriability tests show that about 67 weight percent toluene is required to make a pumpable slurry. Results of thermobalance tests show that initial devolatilization in nitrogen slows the gasification in hydrogen. ERA

N77-33651# Energy Research and Development Administration, Washington, D. C. Div. of Electric Energy Systems.
SYSTEMS ENGINEERING FOR POWER
Mar. 1977 110 p
(ERDA-77-37) Avail: NTIS HC A06/MF A01

The development and availability of conceptual tools needed for planning, engineering, and operating future electric energy systems were examined. An extensive discussion of motivation, objectives and developmental approach of systems management and structuring is reviewed. Status reports on emergency operating state control contracts, organizational forms for large scale systems contracts, factors influencing utility expansion contracts and on test facilities are included. Project summaries in automatic generation control, energy storage evaluation methods, network analysis and synthesis as well as newly issued requests for proposals were outlined. ERA

N77-33652# Princeton Univ., N. J. Dept. of Aerospace and Mechanical Sciences.
OPTIMIZATION AND CHARACTERISTICS OF A SAILWING WINDMILL ROTOR Final Report, 1 Feb. 1976 - 31 Jan. 1976
M. D. Maughmer 31 Jan. 1976 86 p refs Sponsored in part by ERDA
(Grant NSF GI-41891)
(NSF/RANN/GI-41891/FR/75/4) Avail: NTIS HC A05/MF A01

A detailed accounting of the development and operational techniques of the Princeton moving vehicle windmill testing facility is presented. Also presented is a complete documentation of the performance build-up of a 12 foot diameter, two bladed Sailwing rotor. An examination of an exploratory research effort directed toward using a small, first stage, co-axial rotor to augment windmill performance is included. Finally considered are the results and conclusions of an extensive wind tunnel test program aimed at a quantitative determination of the aerodynamic penalties associated with numerous simplifications of the basic double membraned Sailwing cross section. ERA

N77-33653# Battelle Pacific Northwest Labs., Richland, Wash.
K-AREA BOILER-TURBINE ALTERNATOR. VALIDATION TESTS AND VALIDATION PROJECT Final Report
W. R. McSpadden, J. Greenborg, R. E. Mahan, and J. F. Nemec (United Nucl. Ind., Inc., Richland, Wash.) Jan. 1977 111 p refs
(Contract EY-76-C-06-1830)
(BNWL-2168) Avail: NTIS HC A06/MF A01

A project to develop and test mathematical models of the dynamic response of an electric power plant boiler-turbine-alternator (BTA) system to changes in control variables and load variations is described. Ultimately the mathematical models would be used to minimize the consumption of fuel by the power plant during transient conditions. The power plant to be instrumented and used for model validation was one of six 5-MVA units in the K-Areas of the Hanford Project near Richland, Wa. The research required operation of the BTA system under instrumented, controlled conditions. ERA

N77-33654# Sandia Labs., Albuquerque, N. Mex.
SOLAR RADIATION AVAILABILITY FOR NEW MEXICO
E. C. Boes Feb. 1977 18 p
(Contract EY-76-C-04-0789)
(SAND-77-0004) Avail: NTIS HC A02/MF A01

An elementary description is given of the basic geometric considerations and background information on solar radiation availability. In addition, tables giving both average and clear day solar energy availabilities in the four seasons are presented. The solar energy available to a collector depends on the collector type and its orientation. The availabilities are presented for a wide variety of possible surface orientations, including orientations for focusing collectors, tracking collectors, and fixed collectors. ERA

N77-33655# California Univ., Berkeley. Lawrence Berkeley Lab.
ECOLOGICAL CONSIDERATIONS OF THE SOLAR ALTERNATIVES
Mark Davidson, Donald Grether, and Kenneth Wilcox Feb. 1977 48 p refs
(Contract W-7405-eng-48)
(LBL-5927) Avail: NTIS HC A03/MF A01

The main solar technologies are considered including solar thermal power, photovoltaic cells, ocean thermal power, wind energy, solar heating and cooling, bioconversion, and agricultural and process heat. The direct and indirect ecological and environmental impacts of these technologies are discussed. ERA

N77-33656# Sandia Labs., Albuquerque, N. Mex.
OPTICAL PROPERTIES OF CHEMICALLY SPRAYED CdS/Cu/SUB x/S PHOTOVOLTAIC CELLS
R. S. Berg and T. M. Myers Mar. 1977 39 p refs
(Contract EY-76-C-04-0789)
(SAND-76-0729) Avail: NTIS HC A03/MF A01

One of the most interesting fabrication techniques proposed for these photovoltaic devices is a chemical spray technique that can be integrated into a float glass substrate plant. The backwall cell being produced by this technique requires the incident light to pass through the substrate, back contact, and CdS window before illuminating the junction. The cell properties are strongly affected by the optical properties of the constituent films and substrate. Absorption and reflection losses are up to 25% of the photons that can produce collectable electrical carriers. The absorption losses caused by impurities and structures are controllable. Additional photons are lost by transmission through the Cu/sub x/S due to its thinness. The limitations these properties impose on the device as well as modifications and potential improvements are discussed. ERA

N77-33657# TRW Defense and Space Systems Group, Redondo Beach, Calif. Environmental, Power and Facilities Dept.
PLANNING AND DESIGN OF ADDITIONAL EAST MESA GEOTHERMAL TEST FACILITIES. PHASE 1B, VOLUME 2: PROCUREMENT PACKAGE
R. O. Pearson 15 Oct. 1976 375 p refs
(Contract EY-76-C-03-1140; E(04-3)-1140)
(SAN/1140-1/2-Vol-2) Avail: NTIS HC A16/MF A01

Procurement packages of technical specifications and construction drawings for eleven test facilities are presented. Each of the specifications includes all of the technical requirements needed for procurement and construction. The information is presented under the following subject headings: injection pump system: injection pipeline; control and instrumentation spools, calibration test bench, test pad modifications, test pad piping headers, production and injection wells, well 5-2 modifications, well 8-1 down-hole pump, well 6-1 down-hole pump; and well 8-1 booster pump. ERA

N77-33658# Pope, Evans, and Robbins, Inc., New York.
BUILDING ENERGY HANDBOOK. VOLUME 1: METHODOLOGY FOR ENERGY SURVEY AND APPRAISAL
Dec. 1976 319 p refs
(Contract EX-76-C-10-3853)

(ERDA-76-163/1-Vol-1) Avail: NTIS HC A14/MF A01

The United States Energy Research and Development Administration (ERDA) ENERGY HANDBOOKS present guidelines to investigate and analyze energy usage, to identify energy-saving opportunities, and to recommend and evaluate energy conservation measures at ERDA facilities. The methodology was developed and tested while conducting an actual energy conservation survey at a major ERDA installation: Argonne National Laboratory, ANL-East, at Argonne, Illinois. ERA

N77-33659# Pope, Evans, and Robbins, Inc., New York.
BUILDING ENERGY HANDBOOK. VOLUME 2: FORMS FOR ENERGY SURVEY AND APPRAISAL
Dec. 1976 108 p
(Contract EX-76-C-10-3853)
(ERDA-76-163/2-Vol-2) Avail: NTIS HC A06/MF A01

The building energy survey and appraisal forms for use in conjunction with the methodology are provided. Forms for selection of buildings for detailed energy studies, forms for building energy survey and appraisal, and forms for building energy conservation opportunity (ECO) survey and appraisal are included. ERA

N77-33660# TRW Systems Group, McLean, Va.
SYSTEMS STUDIES OF ENERGY CONSERVATION: METHANE PRODUCED FROM COALBEDS, VOLUME 1
Jan. 1977 164 p refs 2 Vol.
(Contract E(46-1)-8042)
(MERC/CR-77/4-Vol-1) Avail: NTIS HC A08/MF A01

Utilization of coalbed methane gas in a practicable and economically favorable manner was studied. The drainage method decreases the quantity of methane released into the environment, reduces ventilation requirements, and enhances mining safety. Legal problems and possible litigations may result when coalbed methane gas is recovered and utilized in a profitable venture since coal right agreements do not imply the right to recover gas released in conjunction with mining requirements. Systems engineering and legal problems are analyzed in detail. I.M.

N77-33661# TRW Systems Group, McLean, Va.
SYSTEMS STUDIES OF ENERGY CONSERVATION: METHANE PRODUCED FROM COALBEDS, VOLUME 2
Jan. 1977 110 p refs 2 Vol.
(Contract E(46-1)-8042)
(MERC/CR-77/4-Vol-2) Avail: NTIS HC A06/MF A01

Coal reserves of the Northern Appalachian Basin are studied and methane recovery investment analysis is made to drain coalbeds by pipeline systems. Both technical and legal problems are analyzed. I.M.

N77-33662# Mitre Corp., McLean, Va. METREK Div.
INTERAGENCY ENERGY/ENVIRONMENT RESEARCH AND DEVELOPMENT PROGRAM: STATUS REPORT 3
Richard Laska Apr. 1977 62 p
(Contract EPA-68-01-3188)
(PB-267443/0; M77-19) Avail: NTIS HC A04/MF A01 CSCL 10A

The EPA-planned and coordinated Interagency Energy/Environment R&D Program is presented. The introduction describes the history, purpose, and scope of the Interagency Program. The second section describes project activity in the five Process and Effects categories. The third section deals with projects underway in the nine Control Technology categories. GRA

N77-33663# Council of State Governments, Washington, D.C.
STATE ENVIRONMENTAL ISSUES SERIES. ENERGY CONSERVATION. POLICY CONSIDERATIONS FOR THE STATES
Nov. 1976 56 p refs
(Grant NSF ISR-75-20393)
(PB-267857/1) Avail: NTIS HC A04/MF A01 CSCL 10A

Trends in state energy conservation activities, general assumptions underlying these actions, and some policy considerations for state involvement in energy conservation efforts are analyzed. Energy conservation opportunities and problems in the two program areas which are the major targets of state energy conservation efforts are identified. These are the regulation of public utilities for energy conservation objectives and improved efficiency of energy use in buildings. GRA

N77-33664# Federal Energy Administration, Washington, D. C. Office of Coal, Nuclear and Electric Power Analysis.
SOLAR COLLECTOR MANUFACTURING ACTIVITY Semiannual Report, Jul. - Dec. 1976
Richard D. Stoll Apr. 1977 27 p
(PB-266985/1; FEA/B-77/135) Avail: NTIS HC A03/MF A01 CSCL 10A

A survey of private firms that have manufactured and sold solar collectors during the second half of calendar year 1976 was conducted for the purpose of obtaining descriptive statistics on economic activity in the solar heating and cooling area and identifying production growth in this industry. Results show that production during the second half of 1976 was 73 percent greater than during the first half of 1976; total production for 1976 was 168 percent greater than that of 1975. GRA

N77-33665# University of Southern Calif., Los Angeles. Office of Interdisciplinary Program Development.
INCENTIVES FOR THE COMMERCIALIZATION OF OCEAN THERMAL ENERGY CONVERSION TECHNOLOGY (OTEC)
Byron J. Washom, Jack M. Nilles, Robert E. Lutz, Daniel Nachtigal, and John R. Schmidhauser Jan. 1977 354 p refs
(Grant NSF ATR-75-18279)
(PB-268097/3; NSF/RA-770088) Avail: NTIS HC A16/MF A01 CSCL 10A

The research program is concerned with the identification of legal, jurisdictional, environmental, institutional, and other nontechnological barriers to the development of solar energy technologies in general, and OTEC in particular, and with the formulation of recommendations for strategies designed to diminish these barriers. The report concentrates on assessing the economic competitiveness with the time of OTEC relative to conventional energy plants, both under existing institutional and regulatory conditions, and as they might appear if the institutional and regulatory conditions and constraints were altered in various ways. GRA

N77-33666# University of Southern Calif., Los Angeles. Office of Interdisciplinary Program Development.
INCENTIVES FOR THE COMMERCIALIZATION OF OCEAN THERMAL ENERGY CONVERSION TECHNOLOGY (OTEC), EXECUTIVE SUMMARY
Byron J. Washom, Jack M. Nilles, Robert E. Lutz, Daniel Nachtigal, and John R. Schmidhauser Jan. 1977 57 p
(Grant NSF ATR-75-18279)
(PB-268096/5; NSF/RA-770087) Avail: NTIS HC A04/MF A01 CSCL 10A

For abstract, see N77-33665.

N77-33667# Massachusetts Inst. of Tech., Cambridge. Aeroelastic and Structures Research Lab.
WIND ENERGY CONVERSION Final Report, Feb. 1975 - Oct. 1976
R. H. Miller, M. Martinez-Sanchez, J. Dugundji, E. E. Larrabee, I. Chopra, T. Humes, S. Y. Chung, J. C. Gohard, and J. T. Edwards Oct. 1976 431 p refs Sponsored in part by ERDA
(Grant NSF AER-75-00826)
(PB-268718/4; ASRL-TR-184-3; NSF/RA-760569; ERDA/NSF-00826-75/3) Avail: NTIS HC A19/MF A01 CSCL 10B

Various problems associated with the design of horizontal axis, low solidity, and high performance wind turbines are investigated. Wind turbine performance as determined from various elementary and more refined momentum theories, aerodynamic vortex theories for blade loadings including unsteady effects and wind shear velocity gradients, and nonlinear dynamic response of rotor blades including gravity and wind shear excitation were studied. GRA

N77-33668# Michigan Governor's Commission on Electric Power Alternatives, Lansing.
REPORT OF THE ADVISORY COMMISSION ON ELECTRIC POWER ALTERNATIVES Final Report
2 Sep. 1976 104 p
(PB-268479/3) Avail: NTIS HC A06/MF A01 CSCL 10A

The general trends in the rates of growth of the demand for electric energy both in the nation and in Michigan are examined. The accuracy of utility industry and state government projections of such electric energy demand growth is assessed, and alternatives that will provide the consumers of Michigan with an adequate supply of electric power are discussed. GRA

N77-33669# National Bureau of Standards, Washington, D. C. Architectural Research Section.
WINDOW DESIGN STRATEGIES TO CONSERVE ENERGY Final Report
S. Robert Hastings and Richard W. Crenshaw Jun. 1977 207 p refs Sponsored in part by HUD
(Contract E(49-1)-3800)
(PB-269297/8; NBS-BSS-104) Avail: NTIS HC A10/MF A01 CSCL 13M

Design strategies for energy efficient windows are presented. The physical phenomena responsible for each strategy's energy performance is explained, and energy and non-energy advantages and disadvantages are summarized. Aesthetic considerations, cost approximations, example installations, and laboratory studies are presented. The overall purpose is to draw attention to the wide range of options currently available to conserve energy with windows. Author

N77-33670# Baker (Michael, Jr.) of New York, Inc., N. Y.
DESIGN GUIDELINES FOR ENERGY CONSERVING SYSTEMS Final Report
A. Salim Qureshi, Griswold L. Moeller, and Eugene Gore Mar. 1977 131 p refs
(Contract V-101C-266)
(PB-268989/1; VA-99-R070-2) Avail: NTIS HC A07/MF A01 CSCL 10A

Analysis of design guidelines and design limitations for the selection, evaluation and design of solar energy systems, total energy and selective energy systems, continuous duty standby systems, engine driven chiller/heat pump systems, and solid waste boiler systems are preserved. GRA

N77-33671# General Accounting Office, Washington, D. C. Energy and Minerals Div.
ENERGY POLICY DECISIONMAKING, ORGANIZATION, AND NATIONAL ENERGY GOALS
24 Mar. 1977 55 p refs
(PB-269299/4; EMD-77-31) Avail: NTIS HC A04/MF A01 CSCL 10A

A number of gaps in the energy policy decisionmaking process which show the need for better coordination among agencies carrying out energy functions and for establishing a system of priorities among energy goals are identified. In addition, energy reorganization and several issues which the Congress should address in enacting legislation to reorganize the Federal energy structure are discussed. GRA

N77-33672# Transportation Systems Center, Cambridge, Mass.
ENERGY STATISTICS: A SUPPLEMENT TO THE SUMMARY OF NATIONAL TRANSPORTATION STATISTICS Annual Report, 1945 - 1975
William F. Gay Aug. 1976 144 p refs
(PB-269301/8; DOT-TSC-OST-76-30) Avail: NTIS HC A07/MF A01 CSCL 10A

Selected time series data describing the transportation, production, processing, and consumption of energy are presented. The revenues and expenses of oil pipeline companies, number and capacities of U.S. tank ships, and the total crude oil transported in the U.S. by method of transportation; growth over time of the U.S. oil and natural gas reserves, refinery capacity, and yields; and trends in the demand for fuel and power are included. GRA

N77-33673# National Bureau of Standards, Washington, D. C. Office of Building Standards and Codes Services.
BUILDING ENERGY CONSERVATION PROGRAMS: A PRELIMINARY EXAMINATION OF REGULATORY ACTIVITIES AT THE STATE LEVEL Final Report
Patrick W. Cooke and Robert M. Eisenhard Jun. 1977 124 p refs Sponsored in part by Federal Energy Admin. and ERDA
(PB-268873/7; NBSIR-77-1259) Avail: NTIS HC A06/MF A01 CSCL 10A

Background information on the current regulatory status and degree of implementation of building energy conservation programs at the state level are described, including those programs dealing with solar energy. This data base can be drawn upon to promote utilization of building thermal efficiency standards on a uniform basis throughout the country. From information collected in a survey of twenty-one states, the report presents the current state-of-the-art on common problems experienced at the state level in the promulgation and implementation of building energy conservation regulations. Based on these findings, several types of assistance that could facilitate the orderly adoption and implementation of uniform standards are identified. GRA

N77-33674# Mitre Corp., McLean, Va. METREX Div.
PUBLIC PARTICIPATION IN ENERGY RELATED DECISION MAKING, EDITED TRANSCRIPTS
Herbert Benington Jan. 1977 413 p Workshop held at McLean, Va., 21-22 Sep. 1976 Prepared in cooperation with the National Academy of Public Administration, Washington, D.C.
(Contract NSF C-1044; Grant NSF PRA-75-21960)
(PB-268781/2; MTR-7367; NSF/PRA-7521960/3/7) Avail: NTIS HC A18/MF A01 CSCL 10A

Edited transcripts of presentations and discussion of plenary sessions of a workshop on public participation in energy related decision making are given. The emergency core cooling system rule making, the consideration of energy parks in Pa., and the Seabrook, New Hampshire nuclear station decisions are summarized, and the process of public participation in each decision is analyzed by participants in the respective cases. Also summarized are the North Anna decision, the Sears Island decision and the Big Rock Point decision. The focus of the workshop is on the processes of public participation and how it may be improved. GRA

N77-33675# National Energy Information Center, Washington, D. C.
ENERGY INTERRELATIONSHIPS. A HANDBOOK OF TABLES AND CONVERSIONS FACTORS FOR COMBINING AND COMPARING INTERNATIONAL ENERGY DATA
Nathaniel B. Guyol Jun. 1977 64 p refs
(PB-269034/5; FEA/B-77/166) Avail: NTIS HC A04/MF A01 CSCL 10A

Facts about the nature, measurement, comparison, and utilization of energy commodities are provided. Precise factors for moving from one system of measurement to another are described. Particular energy commodities and their energy values are indicated. A set of tables is given for reducing different energy commodities, measured in their customary units, to any one of the ten units commonly employed in combining or comparing energy data. GRA

N77-33676# Oak Ridge Associated Universities, Tenn.
NET ENERGY FROM NUCLEAR POWER
A. M. Perry, R. M. Rotty, and D. B. Reister 1977 6 p Presented at Intern. Conf. on Nucl. Power and its Cycles, Salzburg, Austria, 2 May 1977
(IAEA-CN-36/399; Conf-770505-265) Avail: NTIS HC A02/MF A01

Non-fission energy inputs to nuclear fuel cycles were calculated for four types of power reactors and for two grades of uranium ore. Inputs included all requirements for process operations, materials, and facility construction. Supplemental electrical requirements, as a percentage of lifetime electrical output are 5-6% for LWRs using ores with .02% uranium and without recycle. Thermal energy requirements are about 5% of electrical output with conventional ores; shales raise this to about 14% with 0.2% enrichment tails and full recycle electrical. A typical LWR will repay its energy loan within 15 months, allowing for low initial load factors. Enrichment requiring only 10% as much separative work as gaseous diffusion would reduce electrical requirements about 80% but have little effect on thermal energy inputs. HTGRs require slightly less supplemental energy than LWRs. HWRs (with natural uranium) require about one-third as much supplemental electricity, but half again as much thermal energy, largely for heavy water production. ERA

N77-33677# Atomic Industrial Forum, Inc., Washington, D. C.
ROLE OF NUCLEAR POWER IN MEETING FUTURE U.S. ENERGY NEEDS

E. A. Wiggin 1977 14 p Presented at Intern. Conf. on Nucl. Power and its Fuel Cycles, Salzburg, Austria, 2 May 1977
(IAEA-CN-36/396; Conf-770505-272) Avail: NTIS HC A02/MF A01

The likelihood of the U.S. industry's further commitment to nuclear power vis-a-vis comparable commitments in other parts of the world is considered. Those commitments may be contingent upon closing the nuclear fuel cycle. The extent to which such commitments will be influenced by government policy and regulation, financing and manpower requisites, and the challenge of the critics is also addressed. Finally, this paper points out ways in which nuclear power is already a de facto key to a U.S. national energy policy and how it can further contribute to the goal of energy independence. ERA

N77-33678# Oak Ridge National Lab., Tenn.
TECHNICAL AND ECONOMIC STUDIES OF SMALL REACTORS FOR SUPPLY OF ELECTRICITY AND STEAM
I. Spiewak 1977 17 p refs Presented at Intern. Conf. on Nucl. Power and its Fuel Cycles; Salzburg (Austria), 2 May 1977
(IAEA-CN-36/398; Conf-770505-269) Avail: NTIS HC A02/MF A01

Several nuclear steam supply systems in the small and intermediate size range were studied. Detail studies are reported of the Consolidated Nuclear Steam Generator, a 313 MW(t) pressurized water reactor, as applied to industrial energy needs. Both conventional and barge-mounted nuclear steam supply systems are considered. Conceptual studies have been started of pressurized and boiling water reactors in the range of 1000 MW(t), which are envisioned for utility operation for supply of electric power and steam. Design studies of a 500 MW(t) high temperature reactor are also reported. The small reactors are expected to have higher unit costs than the large commercial plants, but to have compensating advantages in high plant availability, shorter construction schedule and greater siting flexibility. Studies are also reported of power cycle parameters and cost allocations for extraction of steam from steam turbine plants. ERA

N77-33679# International Institute for Applied Systems Analysis, Laxenburg (Austria).
ENERGY OPTIONS OPEN TO MANKIND BEYOND THE TURN OF THE CENTURY
W. Haefele 1977 15 p refs Presented at Intern. Conf. on Nucl. Power and its Fuel cycles, Salzburg, Austria 2 May 1977
(IAEA-CN-36/538) Avail: NTIS HC A02/MF A01

The implications of nuclear waste disposal schemes, the releases of large amounts of conversion heat losses as well as security considerations make it necessary to establish also a broad, long range global context for assessments of nuclear energy. The leading consideration is the evolution of the global energy demand. The growth rate in the industrialized nations, the development of the developing nations, and the population growth are considered in some detail. Also, long range trends from labor intensive economies that are mostly agriculture-oriented to energy and/or capital intensive economies are analyzed. The availability of enery reserves and the potential of energy resources is the second line of analysis. Investment requirements and implications of various environmental considerations, specifically those that are global in nature, are considered. Several scenarios for the buildup of future energy systems are studied. Energy storage and transportation, capital and foreign currency constraints, and various degrees of centralization respectively decentralization are evaluated. ERA

N77-33680# Organization for Economic Co-Operation and Development, Paris (France).
WORLD ENERGY SUPPLY AND DEMAND AND THE FUTURE OF NUCLEAR POWER
U. Lantzle 1977 15 p Presented at Intern. Conf. on Nucl. Power and its Fuel, Cycles, Salzburg (Austria) 2 May 1977
(IAEA-CN-36/583; Conf-770505-339) Avail: NTIS HC A02/MF A01

The Organization for Economic Cooperation and Development. (OECD's) world energy outlook analyzed projected trends in energy demand and supply for the OECD area and other major global regions to 1985. It provides a brief discussion of trends after 1985. OECD energy consumption is projected to grow more slowly than in the past. Conservation effects will increase efficiency of energy use per unit of economic growth. All domestic energy supplies in the OECD are projected to expand faster than in the past. The relative share of non-fossil energy sources in total production will be almost doubled. Assuming moderate economic growth, existing energy policies, and a constant real price for oil, the outlook's reference case projects OECD oil import at 35 million barrels a day by 1985. This level of import demand, when combined with the import needs of other oil importing areas, could approach the limit of availability of world oil supplies and as a result cause severe disequilibrium in world energy markets. ERA

N77-33681# Atomic Reactor Centre, Bandung (Indonesia).
NUCLEAR POWER ASPECTS IN AN OIL AND COAL PRODUCING COUNTRY
J. Iljas 1977 24 p refs Presented at Intern. Conf. on Nucl. Power and its Fuel cycles, Salzburg (Austria), 2 May 1977
(IAEA-CN-36/175; Conf-770505-254) Avail: NTIS HC A02/MF A01

Known energy reserves and their potential in the Indonesian Archipelago are described. Resources comprise, next to oil, a significant amount of bituminous coal, natural gas, some hydro and geothermal power, and some radioactive minerals. The possible use of solar and wind energy on the eastern Indonesian islands is discussed. A number of studies have suggested the use of coal and nuclear power as the most economical resources to replace oil. A number of constraints, for both coal and nuclear power, are discussed. A comparison study is made of coal versus nuclear power under the present local conditions. The prospects of nuclear power are reviewed, including the initial steps leading thereto, which have already been taken. In this connection the role of a domestic nuclear industry is being discussed, and also the accelerating effect it may have in the distant future on the growth of electricity from nuclear energy. ERA

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N77-33682 California Univ., Davis.
SKETCHMOD: A POLICY-ORIENTED MODELING PROCESS FOR AIR QUALITY MANAGEMENT Ph.D. Thesis
Robert Keith McCleary, Jr. 1976 214 p
Avail: Univ. Microfilms Order No. 77-13993

The model is used to examine the feasibility of alternative interim oxidant standards based upon variations in automotive emissions potentially resulting from: (1) changes in land use patterns, (2) changes in automotive travel times and travel costs; and (3) variations in automotive emissions control technology. The analysis underscores the significance of the technology of emissions control in satisfying air quality standards, and indicates that technology is the single most important program element for accomplishing emissions reductions. Among program elements that might reduce automotive travel demand and hence decrease vehicular emissions, the analysis indicates that increasing automotive travel times is probably the most effective and appropriate mechanism. Although cost increases can also be effective in reducing demand, the distributional impacts of increasing costs make such an approach less desirable.
Dissert. Abstr.

N77-33683*# Battelle Columbus Labs., Ohio.
REVIEW OF CURRENT INTEREST AND RESEARCH IN WATER HYACINTH-BASED WASTEWATER TREATMENT Final Report
R. K. Markarian, J. E. Balon, and A. C. Robinson Feb. 1977 59 p refs
(Contract NASw-2800)
(NASA-CR-155150; BCL-OA-TFR-77-1) Avail: NTIS HC A04/MF A01 CSCL 13B

The status of activity in the user community for water hyacinth-based wastewater treatment was evaluated. The principal

technique used was that of interviewing people who either (1) were known to be engaged in hyacinth research or development or (2) had made inquiry to NASA about hyacinth systems. About 40 non-research organizations and a similar number of research organizations were contacted. As a result of the interviews and a review of the relevant literature, it was concluded that hyacinth systems have the potential for providing a lower cost way for small cities to meet increasingly stringent effluent requirements. A limited amount of full-scale demonstration of hyacinth systems has been carried out during the past two years, but the yield of design data has been small. Several organizations are currently planning construction of experimental full-scale hyacinth-based wastewater treatment systems during 1977-1978. Author

N77-33684*# Panametrics, Inc., Waltham, Mass.
TOTAL OZONE DERIVED FROM UV SPECTROPHOTOMETER MEASUREMENTS ON THE NASA CV-990 AIRCRAFT FOR THE FALL 1976 LATITUDE SURVEY FLIGHTS Final Report
Frederick A. Hanser Oct. 1977 93 p refs
(Contract NAS3-20472)
(NASA-CR-135276; PANA-UVS-9) Avail: NTIS HC A05/MF A01 CSCL 08K

An ultraviolet interference filter spectrophotometer was modified to use a photodiode and was flown on latitude survey flights in the fall of 1976. Comparison with Dobson station total ozone values shows agreement between UVS and Dobson total ozone of + or - 2 percent. The procedure used to convert UVS measured ozone above the aircraft altitude to total ozone above ground level introduces an additional 2 percent deviation for very high altitude UVS ozone data. Under stable aircraft operating conditions, the UVS derived ozone values have a variability, or reproducibility, of better than + or -1 percent. The UVS data from the latitude survey flights yield a detailed latitude profile of total ozone over the Pacific Ocean during November 1976. Significant latitudinal structure in total ozone is found at the middle latitudes (30 deg to 40 deg N and S). Author

N77-33685# Bolt, Beranek, and Newman, Inc., Canoga Park, Calif.
AIRCRAFT SIDELINE NOISE: A TECHNICAL REVIEW AND ANALYSIS OF COMTEMPORARY DATA
David Q. Walker Apr. 1977 47 p refs
(Contract F33615-76-C-0507)
(AD-A042076; BBN-3291; AMRL-TR-76-115) Avail: NTIS HC A03/MF A01 CSCL 20/1

This report presents a review and analysis of recent aircraft flyover data where the aircraft is at a low angle of elevation relative to the observer. Excess attenuation factors (attenuation in addition to normal spherical divergence and atmospheric absorption losses), evaluated for a range of aircraft types, were found to vary between aircraft and could be generally characterized as a function of aircraft angle of elevation only. Fuselage sheilding or installation effects could not be positively identified although their presence is suggested by the differing excess attenuation characteristics of each aircraft type. Lack of detail in the data available for review precluded the identification of any propagation losses due to turbulent scattering of sound in the atmosphere. The results of the study suggest that currently applied predictive models for sideline noise tend to overestimate noise levels - particularly for 3 and 4 engine aircraft. An alternative approach to sideline noise prediction is suggested and recommendations are made to encourage technical development in this uncertain area of aircraft noise prediction. Author (GRA)

N77-33686# Bolt, Beranek, and Newman, Inc., Canoga Park, Calif.
FURTHER SENSITIVITY STUDIES OF COMMUNITY-AIRCRAFT NOISE EXPOSURE (NOISEMAP) PREDICTION PROCEDURES Final Report
Dwight E. Bishop, Thomas C. Dunderdale, Richard D. Horonjeff, and John F. Mills Apr. 1977 88 p refs
(Contract F33615-76-C-0507; AF Proj. 7231)
(AD-A041781; BBN-3295) Avail: NTIS HC A05/MF A01 CSCL 20/1

This report describes the results of studies of the sensitivity of the noise exposure contours to various model parameters and assumptions presently in the NOISEMAP procedure. The areas within Day/Night Level (LDN) contours for ten Air Force airbases increased by 11 to 40 percent when the noise measure was adjusted for the presence of pure tones. The contour areas for typical mixed fighter, bomber/tanker, and training airbases were reduced by 3 to 11 percent by substitution of the SAE algorithms for ground-to-ground propagation and transition models, whereas adding the fuselage shielding algorithm reduced the contour areas by 13 to 22 percent. Since there is little firm evidence showing one set of algorithms more accurate than the other, the present NOISEMAP models will be retained until further technical analyses or new data show a clear basis for alteration. GRA

N77-33687# Georgia Univ., Athens. Dept. of Zoology.
BEHAVIOR OF MERCURY, CHROMIUM, AND CADMIUM IN AQUATIC SYSTEMS
James E. Schindler and James J. Alberts (ANL, Ill.) Feb. 1977 70 p refs
(Grant EPA-R-800427)
(PB-267559/3; EPA-600/3-77-023) Avail: NTIS HC A04/MF A01 CSCL 08H

Mercury and cadmium show a high affinity for natural organic (humic and fulvic) material. Organic material may also cause or catalyze the reduction of ionic mercury to elemental mercury. The rate of release of elemental mercury from lake sediments depends on both the amount and form of the organic material present, the Eh and pH of the environment. Under continuous exposure, elemental mercury is readily accumulated by fish (Gambusia) at a rate comparable with ionic mercury. However, uptake is five times greater than ionic mercury under periodic exposure conditions. The excretion rates of elemental mercury approximately equal ionic mercury. GRA

N77-33688# Naval Civil Engineering Lab., Port Hueneme, Calif.
THE BIODEGRADATION OF OIL IN SEA WATER FOR NAVAL POLLUTION CONTROL Final Report, 1974 - 1976
Thomas B. ONeill 1 Jul. 1977 15 p refs
(AD-A042375) Avail: NTIS HC A02/MF A01 CSCL 06/1

The report describes the isolation and utilization of pure and mixed microbial cultures for experiments on the biodegradation of crude oil Bunker C fuel and marine diesel. Many microbial species were found that had hydrocarbonoclastic activity. When pure cultures were combined in mixtures the activity was much greater, 91% oxidation in seven days, than the activity of any one of the component species when used in a pure culture. Author (GRA)

N77-33689# Douglas Ecological Consultants Ltd., Victoria (British Columbia).
MONITORING AIR QUALITY WITH LICHEN: A FEASIBILITY STUDY
G. W. Douglas and A. C. Korepa 1976 76 p refs
(NP-21650; Mono-1976-2) Avail: NTIS (US Sales Only) HC A05/MF A01: ERDA Depository Libraries

The data acquired from 12 lichen sample plots indicate that the flora is sufficiently rich and widespread to allow establishment of a lichen air quality monitoring system. A grid network, containing 56 permanent plots, will provide adequate coverage of the region. Partial resurveys should be conducted annually, at least during the first years of the Syncrude plant's operation. Complete resurveys will only be required if a partial resurvey indicates adverse changes are occurring. ERA

N77-33690# Brookhaven National Lab., Upton, N. Y.
CHEMICAL-ANALYTICAL TECHNIQUES FOR AEROSOLS
R. L. Tanner and L. Newman 1977 31 p refs
(Contract EY-76-C-02-0016)
(BNL-22440) Avail: NTIS HC A03/MF A01

Techniques for the sampling and analysis of airborne particles for the purpose of determining the chemical composition of the sulfate content are described. This analytical methodology was applied to speciation of airborne sulfate in several locations and sampling regimens with time resolution of 1 hr or less and with size discrimination in the suboptical particle size range. The benzaldehyde extraction technique was shown to specifically determine sulfuric acid in the presence of bisulfates and sulfates at the 10 mug sulfate level by laboratory experiments and in

field studies. The sulfate mass at the semi-rural BNL sampling site is frequently dominated by sulfuric acid and/or its ammonia-neutralization products. ERA

N77-33691# Oak Ridge Y-12 Plant, Tenn. Environmental Sciences Div.

COMPILATION OF DOCUMENTED COMPUTER CODES APPLICABLE TO ENVIRONMENTAL ASSESSMENT OF RADIOACTIVITY RELEASES

F. O. Hoffman, C. W. Miller, D. L. Shaeffer, C. T. Garten, Jr., R. W. Shor, and J. T. Ensminger Apr. 1977 79 p refs
(Contract W-7405-eng-26)
(ORNL-TM-5830) Avail: NTIS HC A05/MF A01

A compilation of computer codes for the assessment of accidental or routine releases of radioactivity to the environment from nuclear power facilities is presented. The capabilities of 83 computer codes in the areas of environmental transport and radiation dosimetry are summarized in tabular form. The preliminary analysis clearly indicates that the initial efforts in assessment methodology development have concentrated on atmospheric dispersion, external dosimetry, and internal dosimetry via inhalation. The incorporation of terrestrial and aquatic food chain pathways has been a more recent development and reflects the current requirements of environmental legislation and the needs of regulatory agencies. The characteristics of the conceptual models employed by these codes are reviewed. ERA

N77-33692# Brigham Young Univ., Provo, Utah. Thermochemical Inst.

DETERMINATION OF SULFUR SPECIATION IN INDUSTRIAL AEROSOLS IN AN SO2 RICH ENVIRONMENT Progress Report, 15 Jun. 1976 - 14 Jun. 1977

Delbert J. Eatough Mar. 1977 17 p refs
(Contract EY-76-S-02-2988)
(COO-2988-1) Avail: NTIS HC A02/MF A01

Concentrations of sulfite, sulfate, trace metals, and nitrite species in aerosols produced by smelting and fossil fuel industries, establish the conditions (metal content, fuel type, SO2 levels, temperature humidity) and mechanism(s) of sulfite formation and study the stability of the various sulfur species in the ambient atmosphere. Research completed to date has resulted in the development of techniques for the identification of SO3 and SO4 in effluents from a Cu smelter and from fossil fuel combustion. ERA

N77-33693# Los Alamos Scientific Lab., N. Mex.

DEVELOPMENT OF AIR-MONITORING TECHNIQUES USING SOLID SORBENTS. LASL PROJECT R-059, NIOSH-IA-77-12 Progress Report, 1 Apr. - 30 Sep. 1976

G. O. Wood and R. G. Anderson Mar. 1977 26 p refs
(Contract W-7405-eng-36)
(LA-6738-PR) Avail: NTIS HC A03/MF A01

A sampling and analysis method for four hydrazine compounds in air was completed. Final modifications of the sampling tube and analytical procedure were made and tested. Characteristics of the analytical procedure were studied to determine upper and lower limits of measurement and precision. The total sampling and analysis method was tested for precision by comparing results from pairs of samples taken and analyzed simultaneously. Tube samples of vapor analyzed by gas chromatography were compared to parallel bubbler samples analyzed by colorimetry. Results were statistically the same. ERA

N77-33694# Oak Ridge Y-12 Plant, Tenn. Computer Sciences Div.

DISCRETE EVENT APPROACH TO POLLUTANT TRANSPORT AND VEGETATION EFFECTS

B. D. Murphy and Kenneth R. Dixon Mar. 1977 24 p refs
(Contract W-7405-eng-26)
(ORNL-CSD-TM-11; ESD-1016) Avail: NTIS HC A02/MF A01

Pollutant dispersion in the atmosphere together with plant carbon assimilation were modeled for a growing season in the vicinity of a source of C-14. The modeling studies point out the importance of accounting for correlations between the dispersion climatology and patterns of plant growth processes. There are significant differences between the detailed modeling of a typical season on an hour-by-hour basis and results using yearly averaged values of atmospheric concentration. ERA

N77-33695# Oak Ridge National Lab., Tenn. Regional Environmental Systems Analysis Program.

REFLECTIONS OF REGIONAL ENVIRONMENTAL SYSTEMS

C. W. Craven, Jr. Mar. 1977 84 p refs
(Contracts W-7405-eng-26; NSF IA-AAA-R-4-79)
(ORNL-RUS-26) Avail: NTIS HC A05/MF A01

An improved basis for forecasting the environmental impacts of public and private decisions (such as land use) in order to improve environmental and energy resource management was developed and communicated to the planning and management community. The research strategy was to develop and validate a hierarchy of computer models to assist in the analysis of relevant economic, physical, ecological, and social processes in a 16-county region of east Tennessee. Although the principal focus of the work is on a 6,500 square mile region in eastern Tennessee, the approach is designed to be applicable to other regions. ERA

N77-33696# Technical Univ. of Norway, Trondheim. Akustisk Lab.

AIRPLANE NOISE: DIMENSIONS AND MEANS OF NOISE REDUCTION

M. Ringheim Oct. 1976 13 p refs In NORWEGIAN; ENGLISH summary
(ELAB-STF44-A75080; ISBN-82-595-696-3) Avail: NTIS HC A02/MF A01; Tech. Univ. of Norway, Trondheim Nor. Kr. 20

An estimate was made of the number of people exposed to noise from military and civil aircraft in Norway. Possibilities for the reduction of noise exposure are reviewed and costs are estimated for various alternatives. ESA

N77-33697# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Physik der Atmosphaere.

SIGNIFICANCE OF ENVIRONMENTAL RESEARCH TASKS AT THE GERMAN AVIATION AND SPACE RESEARCH INSTITUTE [DIE BEDEUTUNG DER AUFGABEN DER UMWELTFORSCHUNG IN DER DFVLR]

D. Paffrath [1976] 32 p refs In GERMAN
(DLR-IB-553-75/5) Avail: NTIS HC A03/MF A01

General problems of environmental research in the near and far future are presented, and the environmental research program of the Federal Republic of Germany is discussed. The proposed activities of the German Aviation and Space Society task force Flight Technique and Environment Research will cover flight noise, emission of noxious gases from engines, atmospheric investigations, remote sensing of the earth, ecology, structural research, and communal technique. ESA

N77-33698# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Physik der Atmosphaere.

CONSIDERATIONS ON AIR POLLUTION PROPAGATION FROM AIRCRAFT [UEBERLEGUNGEN ZUR AUSBREITUNG VON LUFTVERUNREINIGUNGEN AUS FLUGZEUGEN]

D. Paffrath Apr. 1975 22 p refs In GERMAN
(DLR-IB-553-75/6) Avail: NTIS HC A02/MF A01

Factors having an influence on the pollutant concentration, such as emission rate, source density, meteorological conditions, solar radiation, and nature of the emission, are presented. The diffusion gradient theory and its application to smoke propagation from a chimney is discussed. The turbulent diffusion coefficient k is dealt with, and the propagation of aircraft engine exhaust gases is discussed. ESA

N77-33699# Adams (Ronald), New York.

ASSESSMENT OF SERVICE REQUIREMENTS AND DESIGN CHARACTERISTICS OF PRESENT AND FUTURE PARATRANSIT VEHICLES Final Report

Ronald Adams Apr. 1977 116 p
(PB-267574/2; UMTA-NY-06-0058-77-1) Avail: NTIS HC A06/MF A01 CSCL 13F

An assessment of present and future paratransit vehicles, their design characteristics and service requirements from the viewpoint of the passenger, the community, and the driver is presented. This assessment includes comfort, safety, and assessibility of all occupants with particular attention to the special driver problems associated with paratransit service; it focuses on the problems of the elderly and handicapped; and it identifies relevant aspects of the operating environment, namely, pedestrian safety. GRA

N77-33700# Pacific Environmental Services, Inc., Santa Monica, Calif.

RELIABILITY STUDY OF VAPOR RECOVERY SYSTEMS AT SERVICE STATIONS

R. J. Bryan, L. G. Wayne, and R. L. Norton Mar. 1976 102 p
(Contract EPA-68-02-1405)
(PB-267613/8; EPA-450/3-76-001) Avail: NTIS HC A06/MF A01 CSCL 13B

A study was conducted of the operational reliability of vapor recovery systems at gasoline service stations in San Diego County, California. Periodic inspections at 24 stations were conducted to examine the condition of these systems, to determine their operational status, and to check for detectable gasoline vapor losses from control equipment. The study demonstrated that capture of vapors at the vehicle was more effective with vacuum-assisted systems than with vapor balance systems. However, the reliabilty of the vacuum-assisted systems was not good in general although there was substantial variation depending upon the type of unit. GRA

N77-33701# Radian Corp., Austin, Tex.

EVALUATION OF CONTINUOUS MONITORING SITES IN EPA REGION 6 Final Report

May 1977 50 p
(Contract EPA-68-02-1383)
(PB-269223/4; RAD-77-100-044-16-04; EPA-906/9-77-001a) Avail: NTIS HC A03/MF A01 CSCL 13B

Methods and results of a quality assurance study of selected municipal and state air monitoring programs being conducted in EPA Region 6 are described. The continuous analyzers that were evaluated were analyzers for ozone and carbon monoxide. A visit to each monitoring station was carried out to perform a systems analysis of the station, to evaluate the site, and to perform an audit of the continuous monitors using control gases. Data processing checks were also performed at the agency offices. GRA

N77-33702# Arizona Univ., Tucson.

PRACTICAL USE OF DECISION THEORY TO ASSESS UNCERTAINTIES ABOUT ACTIONS AFFECTING THE ENVIRONMENT Final Report, 16 Aug. 1974 - 15 Jan. 1977

Lucien Duckstein, Martin M. Fogel, Donald R. Davis, and Jean Weber Feb. 1977 46 p refs
(Contract DI-14-31-0001-5056)
(PB-269011/3; W77-08927; OWRT-B-043-ARIZ(16)) Avail: NTIS HC A03/MF A01 CSCL 13B

A multiobjective system framework using Bayesian Decision Theory was developed. As a result salient features of an environmental impact statement that properly considers uncertainties are given. Decision theory can be used to advantage in applying this methodology to assess the effect of natural and informational uncertainty. The methodology developed shows how uncertain information and scientific models can be used to advantage in planning the future. GRA

N77-33703# California Inst. of Tech., Pasadena.

PARTICLE SIZE DISTRIBUTION OF NITRATE AEROSOLS IN THE LOS ANGELES AIR BASIN Interim Report, Oct. 1975 - Dec. 1976

A. H. Moskowitz May 1977 43 p refs
(Grant EPA-R-802160)
(PB-269349/7; EPA-600/3-77-053) Avail: NTIS HC A03/MF A01 CSCL 14B

The atmospheric aerosol was sampled with a low pressure impactor at a coastal, an urban, and an agricultural site in the Los Angeles air basin. The material collected on each stage was analyzed for nitrate by direct vaporization into a chemiluminescent analyzer. The coastal nitrate size distribution consisted mainly of particles which have diameters greater than 2.0 micrometers whereas the nitrate in the agricultural region was found primarily in the submicron range. The urban location, was bimodal about the 1 to 2 micrometers range. The submicron aerosol was ammonium nitrate while the larger size fraction was sodium nitrate. GRA

N77-33704# Environmental Protection Agency, Washington, D. C. Office of Noise Abatement and Control.

INSPECTION OF FEDERAL FACILITIES FOR COMPLIANCE WITH NOISE ABATEMENT STANDARDS

Dec. 1976 54 p refs
(PB-269298/6; EPA-550/9-77-350) Avail: NTIS HC A04/MF A01 CSCL 13B

Guidance is provided to the Environmental Protection Agency regional offices for identifying noise problems at Federal facilities, selecting facilities to be inspected for compliance with environmental noise requirements and conducting noise inspections at Federal facilities. GRA

N77-33705# Little (Arthur D.), Inc., Cambridge, Mass.

EVALUATION OF STATIONARY SOURCE PARTICULATE MEASUREMENT METHODS. VOLUME 2: OIL-FIRED STEAM GENERATORS Interim Report, Oct. 1973 - Feb. 1976

Edward T. Peters and Jeffrey W. Adams Feb. 1977 66 p
(Contract EPA-68-02-0632)
(PB-269081/6; EPA-600/2-77-026-Vol-2) Avail: NTIS HC A04/MF A01 CSCL 14B

An experimental study was conducted to determine the reliability of the Method 5 procedure for providing particulate emission data from an oil fired steam generator. The study was concerned with determining whether any 'false' particulate resulted from the collection process or from the collected particulate. Variations to Method 5 tested included filter media, size and temperature, nozzle type and sampling duration. By comparing particulate and sulfate distributions between probe and filter catches, no evidence for the formation of 'false particulate' for the condition evaluation were found. GRA

N77-33706# Tri-State Regional Planning Commission, New York.

METHODS USED TO ESTIMATE AIR POLLUTANT EMISSIONS 1974, 1980, AND 2000. NEW JERSEY, NEW YORK: CONNECTICUT AIR QUALITY CONTROL REGION Final Report

Jocelyn M. Bishop, Paul M. Nutkowitz, and Hall Winslow May 1977 236 p
(Contract EPA-68-02-2096)
(PB-269667/2; EPA-902/4-77-006; R-572) Avail: NTIS HC A11/MF A01 CSCL 13B

Methods, procedures and data inputs used in calculating air pollutant emissions for subsequent dispersion modelling are reported. Information is arranged by area sources and point sources, for state portions and New York City. The report shows data deficiencies and modifications of methods necessary in an 8500-sq mi 3-state region. It demonstrates how the extensive land use and transportation planning resources of an interstate metropolitan planning agency can be used in estimating emissions. GRA

N77-33707# Utah State Univ., Logan.

SUSPENDED AND DISSOLVED SOLIDS EFFECTS ON FRESHWATER BIOTA: A REVIEW Final Report, Jul. - Dec. 1976

Darwin L. Sorenson, Margaret M. McCarthy, E. Joe Middlebrooks, and Donald B. Porcella Apr. 1977 76 p refs
(PB-269180/6; EPA-600/3-77-042) Avail: NTIS HC A05/MF A01 CSCL 13B

Research needs appropriate to setting freshwater quality criteria for suspended and dissolved solids are defined by determining the state of our knowledge from a critical review of recent literature. The major research need was defined as the development and/or application of concepts of community response to suspended and dissolved solids concentrations and loads. The role of suspended solids in transporting toxic substances, aesthetic evaluation of suspended solids in aquatic ecosystems, and dissolved solids in drinking water, and economic

aspects of dissolved solids in municipal-industrial water were defined as research needs. GRA

N77-33708# Scott Environmental Technology, Inc., Plumsteadville, Pa.
EVALUATION OF CONTINUOUS MONITORS FOR CARBON MONOXIDE IN STATIONARY SOURCES Final Report, Jul. 1975 - Mar. 1976
Mark Repp Mar. 1977 166 p
(Contract EPA-68-02-1400)
(PB-268861/2; EPA-600/2-77-063) Avail: NTIS HC A08/MF A01 CSCL 14B

The performance characteristics of five commercially available continuous carbon monoxide monitors were evaluated in a two part program consisting of laboratory and field phases. The laboratory phase involved testing each instrument for response characteristics, precision, noise, response times, drifts, variations due to temperature and pressure, and CO2 and H2O interferences. The field evaluation phase involved the operation of the monitors on the outlet duct of a carbon monoxide boiler at a petroleum refinery. Data generated in both phases of the program were used as the basis for recommending minimum performance specifications for continuous carbon monoxide monitors at petroleum refineries. GRA

N77-33709# WAPORA, Inc., Charleston, Ill.
ECONOMIC IMPACT OF PROPOSED AMENDMENT TO WATER POLLUTION REGULATIONS FOR HEXANE EXTRACTABLE MATERIALS, R74-1, 8, 9 Final Report
Lawrence W. Bates 12 May 1977 200 p refs Sponsored by Illinois Inst. for Environmental Quality, Chicago
(PB-269184/8; IIEQ-77-17) Avail: NTIS HC A09/MF A01 CSCL 05C

The potential economic impacts of a proposed change in a pollution control regulation of the Illinois Pollution Control Board were investigated. The proposed amendment would alter the current 15 mg/l standard for total oil discharged from point sources. Three alternative scenarios were designated by Illinois Institute of Environmental Quality for economic evaluation. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N77-33710# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THAUMASIA: A FOSSILIZED, EARLY-FORMING THARSIS UPLIFT Ph.D. Thesis - Md. Univ.
Herbert Frey Sep. 1977 34 p refs
(Grant NGL-21-002-033)
(NASA-TM-X-71404; X-922-77-241) Avail: NTIS HC A03/MF A01 CSCL 08G

A Martian tectonic feature is investigated. The structure of the present-day Valles Marineris rift canyons and related features is a consequence of episodic crustal uplift, dominated by two major events. The first of these occurred near the present day Thaumasia crustal dome, and produced a structural pattern in old plainsforming units which is principally transverse to the main trend of the Valles Marineris canyons. This pattern has provided some structural control over later tectonic and volcanic events. The major crustal deformation in this region is associated with the younger Tharsis uplift, which is responsible for the major trends observed in the Valles Marineris. These two distinct structural patterns are best observed in the resistant, least eroded parts of the canyon walls; linear trends in such resistant points provide a closer approximation to the original bounding scarps of the Martian rifts than do the modern, highly eroded canyon walls. Crustal deformation was dominated by the Tharsis uplift, but began much earlier in Martian history. Author

N77-33711 Pittsburgh Univ., Pa.
THE PALEOMAGNETISM OF THE PALISADE SILL AND THE DEVELOPMENT OF THE ARM CORRECTION METHOD OF PALEOINTENSITY DETERMINATION Ph.D. Thesis
Peter Anthony Rigotti 1976 258 p
Avail: Univ. Microfilms Order No. 77-15159

A high resolution secular variation record for a time span of about 1500 years appears to have been recorded by the 335m-thick Palisade Sill, New Jersey. For the upper 70m of the sill, two parallel sections separated by 70m and sampled at high density, served as a check on the reliability of the record. A structural tilt of 12 deg to the WNW was first removed on the basis of the orientation of the enclosing sedimentary rocks in the Newark Formation. The smoothed secular variation record shows a range in inclination from 25 deg to 55 deg with a mean of 43.6 deg and a range in declination from 355 deg to 10 deg with a mean of 2.5 deg. A method was developed for recovering paleointensities from igneous rocks. The method requires only a single heating to the Curie temperature, utilizing partial anhysteretic remanence magnetism acquisition measurements before and after the heating to separate distortions of the coercivity spectrum, from viscous components present in the natural remanence. Dissert. Abstr.

N77-33712 Columbia Univ., New York.
A STUDY OF THE MARINE MAGNETIC ANOMALY PATTERN EMPLOYING TECHNIQUES BASED ON THE FAST FOURIER TRANSFORM ALGORITHM Ph.D. Thesis
John Linwood LaBrecque 1977 278 p
Avail: Univ. Microfilms Order No. 77-14821

Applications of the Cooley-Tukey fast Fourier transform algorithm to forward and inverse calculations of marine magnetic anomalies are presented. A method of deriving the magnetization distribution as well as the process and earth filters via the assumptions and techniques of homomorphic deconvolution is developed. An iterative technique for removing the shape asymmetry or skewness of magnetic anomalies verifies the general validity of the skewness parameter as a measure of shape assymetry. Results of a study of the marine magnetic anomaly pattern for detailed paleomagnetic field behavior is presented as well as a revised magnetic reversal time scale for the Late Cretaceous and Cenozoic. Dissert. Abstr.

N77-33713 Alaska Univ., College.
SPIRAL-LIKE AURORAL FORMS: OBSERVATIONS AND A PROPOSED THEORY Ph.D. Thesis
Thomas James Hallinan 1976 133 p
Avail: Univ. Microfilms Order No. 77-15142

An analysis of auroral images obtained from all-sky cameras, TV cameras, and satellite scanners was made. Discrete arcs were found typically subject to rational distortions similar to those which occur in sheared layers of fluids. According to their spacing along the arc, their shapes, and their temporal behavior, these distortions were divided into three types: (1) spirals are clockwise, vortex-like forms, which are reversible and have spacings from 50 km to greater than 1,000 km;(2) folds are reversible and sine-wave-like with a wavelength near 20 km and a pronounced skew in a clockwise sense; (3) curls are irreversible counterclockwise vortices which have a typical spacing of 5 km. Dissert. Abstr.

N77-33714 Tulsa Univ., Okla.
SECONDARY SOURCES OF SEISMIC NOISE Ph.D. Thesis
Robert Lee Geyer 1977 310 p
Avail: Univ. Microfilms Order No. 77-14370

Examples of terrane response derived from the analysis and interpretation of data obtained by Stanolind Research Party 45 (now Amoco Production Company) in New Mexico, North Dakota, and West Texas, are presented. The secondary sources, the types of waves, the mechanisms of secondary-wave generation, and the relations between secondary waves and reflection quality were identified. Analysis was restricted to waves propagated on the surface and in near-surface layers to a depth of about 300 ft. Field data were obtained both in good reflection areas and in areas having NG reflection quality. Individual secondary sources were located and three types were recognized: (1) localities with sharp topographic relief, (2) boundaries between outcrops and adjacent alluvium, and (3) other localities associated with sharp relief of a subsurface interface such as the weathering base. The surface secondary waves were found to be Rayleigh-type waves. Some of these waves were generated by direct Rayleigh-

type waves; others by body waves that emerged at surface or near-surface boundaries with sharp relief. Dissert. Abstr.

N77-33715 Columbia Univ., New York.
THEORETICAL SEISMOGRAMS OF CODE PHASES CALCULATED BY A FREQUENCY-DEPENDENT FULL WAVE THEORY, AND THEIR INTERPRETATION Ph.D. Thesis
George Leong Choy 1977 146 p
Avail: Univ. Microfilms Order No. 77-14789

The mechanism of wave form distortion and the modification of wave forms due to frequency dependent effects not predicted by classical ray theory are described. A frequency dependent full wave theory, that is computationally practical and suitable for routine use either for computing amplitude and phase spectra of body waves or for synthesizing seismograms of body waves was incorporated. Because real data is recorded as a function of time, the conclusions are carefully substantiated by comparing theoretical solutions in the time domain with actual seismograms. Dissert. Abstr.

N77-33716 Columbia Univ., New York.
THE SHAPES OF MARINE MAGNETIC ANOMALIES: PALEOMAGNETIC FIELD BEHAVIOR, PALEOMAGNETIC POLES AND RIDGE CREST PROCESSES Ph.D. Thesis
Steven Carl Cande 1977 93 p
Avail: Univ. Microfilms Order No. 77-14787

The shapes of marine magnetic anomalies are examined to resolve details of paleomagnetic field behavior and the process by which the oceanic crust acquires its magnetization. Small scale anomalies super-imposed on the regular pattern of marine magnetic anomalies may represent either short polarity reversals or fluctuations in the intensity of the paleomagnetic dipole field. A method is presented for determining paleomagnetic poles from the skewness of marine magnetic anomalies. The skewness of a magnetic anomaly defines a semi-great circle determined for two sets of contemporaneous anomalies on a rigid plate intersect to give a unique paleomagnetic pole. This method is applied to Late Cretaceous anomalies in the Pacific and Atlantic Oceans. Dissert. Abstr.

N77-33717*# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
ON THE ROLE OF MAGNETIC MIRRORING IN THE AURORAL PHENOMENA
Walter Lennartsson Dec. 1976 66 p refs Sponsored by NASA
(NASA-CR-155144; TRITA-EPP-77-11) Avail: NTIS HC A04/MF A01 CSCL 04A

On the basis of field and particle observations, it is suggested that a bright auroral display is a part of a magnetosphere-ionosphere current system which is fed by a charge-separation process in the outer magnetosphere (or the solar wind). The upward magnetic-field-aligned current is flowing out of the display, carried mainly by downflowing electrons from the hot-particle populations in the outer magnetosphere (the ambient cold electrons being depleted at high altitudes). As a result of the magnetic mirroring of these downflowing current carriers, a large potential drop is set up along the magnetic field, increasing both the number flux and the kinetic energy of precipitating electrons. It is found that this simple basic model, when combined with wave-particle interactions, may be able to explain a highly diversified selection of auroral particle observations. Author

N77-33718# Weapons Research Establishment, Adelaide (Australia).
INVESTIGATIONS OF SMALL SCALE STRUCTURE OF IONISATION IN THE D REGION USING A LANGMUIR PROBE
K. H. Lloyd, G. G. OConnor, and C. J. Beach May 1977 18 p refs
(WRE-TR-1816(W); AR-000-562) Avail: NTIS HC A02/MF A01

Electron density profiles were measured on two rocket flights flown from Woomera using a nose tip Langmuir probe. Partial reflection of 2 MHz radio signals, used as a technique to measure winds in the ionosphere, have shown preferential heights of enhanced reflection. A knowledge of the electron density would help in determining the reason for these preferred heights. Author

N77-33719*# Delaware Univ., Newark. Dept. of Geology.
SEARCH FOR NORTH AMERICAN MICROTEKTITES IN GEORGIA COASTAL PLAIN SEDIMENTS Final Technical Report
Billy P. Glass [1976] 22 p
(Contract NAS5-23649)
(NASA-CR-152596) Avail: NTIS HC A02/MF A01 CSCL 08G

Microfossils recovered from four wells drilled in Dodge, Bleckley, and Pulaski Counties in Georgia served as the major means of dating the material. In addition, nannofossils were used to date a marl from the bottom of two holes. Correlation of the lithology and microfossil data with well data indicates that the Eocene/Oligocene boundary was penetrated in at least one hole taken in Dodge County. Author

N77-33720*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DESCRIPTION AND REVIEW OF GLOBAL MEASUREMENTS OF ATMOSPHERIC SPECIES FROM GASP
Daniel J. Gaunter, J. D. Holdeman, Daniel Briehl, and Francis M. Humenik Aug. 1977 25 p refs Presented at Conf. on Air Quality Meteorology and Atmospheric Ozone, Boulder, Colo., 31 Jul. - 6 Aug. 1977; cosponsored by Am. Soc. for Testing and Mater. Comm. D-22, Am. Meteorol. Soc., Air Pollution Control Assoc., EPA, Intern. Ozone Inst., NBS, and NOAA
(NASA-TM-73781; E-9338) Avail: NTIS HC A02/MF A01 CSCL 04A

Aerosol composition data were collected with a NASA F-106 aircraft. Present measurements include ozone, carbon monoxide, water vapor, aerosol and condensation nuclei number densities, sulphates, nitrates, and the chlorofluoromethanes. Meteorological and flight parameters are also recorded for use in data analysis. The present aircraft operations obtain data between 6 and 13.5 km from 65 degree N between Europe and the north Pacific, and from 23 degree S over South America and 42 degree S over New Zealand. Typical constituent data from the aircraft operations during the first one and a half years are presented. Instrumentation is discussed. Author

N77-33721*# Pennsylvania State Univ., University Park. Ionosphere Research Lab.
THE ENERGY BALANCE OF THE NIGHTTIME THERMOSPHERE
David Alan Glenar Nov. 1977 137 p refs
(Grant NGL-39-009-003)
(NASA-CR-155194; PSU-IRL-SCI-457) Avail: NTIS HC A07/MF A01 CSCL 04A

The discrepancy between the input from the day hemisphere and the observed loss rates is discussed in terms of ion-neutral processes and gravity wave inputs. There has been considerable speculation as to the energy balance of the thermosphere and in particular about the fraction of the total energy input supplied by ultraviolet radiation. The problem is considerably simplified by considering the energy balance of the nighttime hemisphere alone. Sunrise and sunset vapor trail measurements provide data on the wind systems at the terminator boundary, and temperature measurements provide information on the vertical energy conduction. North-south winds from high latitude vapor trail measurements provide a measure of the energy input from auroral processes. Author

N77-33722# Naval Postgraduate School, Monterey, Calif.
AN ANALYSIS OF EARTHQUAKE FREQUENCY DATA Technical Report, 1 Jan. 1969 - 31 Dec. 1971
R. H. Shudde and D. R. Barr Dec. 1976 17 p refs
(RR0000110)
(AD-A035813; NPS-55SU76121) Avail: NTIS HC A02/MF A01 CSCL 08/11

Analyses of the times of occurrence of the major earthquakes recorded in periods of several years duration are presented for two regions along the San Andreas Fault in Central California. Components of tidal force and jerk are computed for each earthquake in the sample. The distributions of these quantities over the sample periods are compared with corresponding

distributions obtained under the hypothesis of random occurrence. It is concluded that the evidence provided by this analysis does not support a hypothesis of significant tidal effects upon earthquake occurrences, in the populations considered.
Author (GRA)

N77-33723# Aerospace Corp., El Segundo, Calif. Ivan A. Getting Lab.
NEUTRAL ATMOSPHERIC WAVES IN THE THERMOSPHERE AND TROPOSPHERIC WEATHER SYSTEMS
Interim Report
Carl J. Rice and Lawrence R. Sharp 10 May 1977 29 p refs
(Contract F04701-76-C-0077)
(AD-A041239; TR-0077(2960-04)-3; SAMSO-TR-77-98) Avail: NTIS HC A03/MF A01 CSCL 04/1

Neutral atmospheric density profiles between 130 and 225 km obtained by a cold cathode ion gauge onboard the AE-C spacecraft frequently exhibit considerable wave-like structure. This structure is interpreted to be propagating internal gravity waves. We have attempted to correlate the probability of occurrence and amplitude of the waves with several parameters of geophysical importance. Only weak or no correlation is found with the common parameters, such as Kp, for which a dependence of the average total density is known to exist. The waves do seem to appear in certain preferred geographical locations, however. These locations tend to coincide with regions of high wind speeds in the upper troposphere. This leads us to suggest that the majority of the observed waves originate in the troposphere, subsequently propagating upwards into the thermosphere. Author (GRA)

N77-33724# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
LIDAR DETECTION OF SUBVISIBLE REENTRY VEHICLE EROSIVE ATMOSPHERIC MATERIAL
Roberto Rubio Mar. 1977 40 p refs
(DA Proj. 1L1-61102-B-53A)
(AD-A041085; ECOM-5813) Avail: NTIS CSCL 04/1

This report describes a lidar technique employed to detect conventionally undiscernible atmospheric particulate concentrations which cause unexpected nose-cone erosions of reentry missiles. It also describes the experiment, data, and data analysis results obtained during several Athena-H reentry missions conducted at White Sands Missile Range, New Mexico. Lidar data recorded on the Athena-H reentry nights of 26 April and 24 August 1973 provided information on subvisible tenuous layers located at heights of 9.3 km and 14.3 km, respectively. Analysis of the lidar data, concurrently recorded radiosonde meteorological data, and a clear day aerosol model yielded an average volume backscattering coefficient of 0.000043/m for the 9.3 km layer which was 310 m thick and 0.000032/m for the 14.3 km layer which was 500 m in depth. Calculations based on previous in-situ measurements of particulate sizes and elemental composition yielded an average concentration of 3.7 x 10 to the 5th power liquid droplets/cu/m or 26,000 ice crystals/cu/m for the 26 April cloud striation and an average concentration of 20,000 ice particles/cu/m or 2.2 x 10 to the 8th power arid particles/cu/m for the 24 August layer. The lidar data clearly distinguished between a truly clear atmospheric path, 21 March, and an apparently clear atmospheric path, 26 April and 24 August. Author (GRA)

N77-33725# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
CALCULATION OF SELECTED ATMOSPHERIC COMPOSITION PARAMETERS FOR THE MID-LATITUDE, SEPTEMBER STRATOSPHERE
Harold N. Ballard, Jose M. Serna (Phys. Sci. Lab., Las Cruces, N. Mex.), and Frank P. Hudson (Sandia Labs., Albuquerque, N. Mex.) May 1977 52 p refs
(DA Proj. 1L1-61102-B-53A)
(AD-A041081; ECOM-5818) Avail: NTIS HC A04/MF A01 CSCL 04/1

Because of the complexity and variability of the stratosphere, a computerized model approximating stratospheric behavior, in combining theory and actual measurements, is a powerful diagnostic tool. A model is very useful as an aid in developing both the general approach and the details of a field measurements program, and as an important tool in interpreting the experimental data of such a program. The interplay between measurements and model should produce the most effective approach to study of the stratosphere. This document contains a few examples of calculational results from the ASL Numerical Model of Atmospheric Radiation (ANMAR), Composition and Dynamics, paralleling the conditions of the recent set of STRATCOM VI experiments. They demonstrate the range of results obtainable and the detail of treatment possible using the modeling approach. GRA

N77-33726# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
BOUNDARY LAYER DUST OCCURRENCE. 4: ATMOSPHERIC DUST OVER SELECTED GEOGRAPHICAL AREAS
B. D. Hinds and G. B. Hoidale Jun. 1977 50 p refs
(DA Proj. 1T1-61101-A-91A)
(AD-A041077; ECOM-DR-77-3) Avail: NTIS HC A03/MF A01 CSCL 04/2

This is the fourth in a series of reports designed to provide a guide to the occurrence of atmospheric dust over selected geographical areas. Tabular data on the duration and on the diurnal and monthly variations in the probability of occurrence of blowing dust (visibility less than 11 km) and of dust storms (visibility less than 1 km) are presented for 45 stations which averaged at least 3.7 days per year (1%) with blowing dust. The 45 stations were geographically distributed as follows: Angola (2), Australia (1), China (1), Italy (1), Mali (13), Mauritania (11), Mexico (4), Niger (5), North Korea (1), Peru (2), South Korea (1), Spanish Sahara (2), and Venezuela (1). For 257 stations (in 35 countries) which averaged less than 3.7 days per year with blowing dust, tabular dust data are limited to the mean annual number of days with blowing dust and dust storms.
Author (GRA)

N77-33727# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
CALCULATIONS OF SOFT AURORAL BREMSSTRAHLUNG AND K ALPHA LINE EMISSION AT SATELLITE ALTITUDE
Interim Report
Janet G. Luhmann and J. Bernard Blake 23 Jun. 1977 31 p refs
(Contract F04701-76-C-0077)
(AD-A041599; TR-0077(2260-20)-8; SAMSO-TR-77-12623) Avail: NTIS HC A03/MF A01 CSCL 04/1

Satellite altitude (450 nm) fluxes of 0.1- to 10-keV auroral X-rays are calculated for some typical forms of incident electron spectra. Both bremsstrahlung and K alpha line emission are included. These calculations indicate that K alpha emission can increase the observable intensity of satellite altitude auroral X-rays by up to 100 times, thereby making soft X-rays an ideal medium for imaging the aurora. Author (GRA)

N77-33728# Virginia Univ., Charlottesville. Dept. of Engineering Science and Systems.
DEVELOPMENT OF FINITE ELEMENT MODELS FOR THE EARTH'S GRAVITY FIELD. PHASE 1: MACROGRAVITY MODEL FOR SATELLITE ORBIT INTEGRATION
John L. Junkins Feb. 1977 33 p refs
(Contract DAAG53-76-C-0067)
(AD-A038463; UVA/525023/ESS77/103; ETL-0096) Avail: NTIS HC A03/MF A01 CSCL 08/14

As alternatives to lengthy globally valid series representations of the geopotential, piecewise modeling for the gravity field is investigated. A degree 23 spherical harmonic representation is replaced by 1500 local gravity functions within the spherical shell from 1 to 1.2 earth radii. Worst case acceleration errors enter in the 7th significant digit, computational speed is improved by an order of magnitude. Author (GRA)

N77-33729# Lamont-Doherty Geological Observatory, Palisades, N. Y.
PLATE TECTONICS AND THE DISCRIMINATION OF UNDERGROUND EXPLOSIONS FROM EARTHQUAKES
Final Report, 1 Oct. 1975 - 31 Mar. 1977
Andrew J. Murphy and Lynn R. Sykes 1 Apr. 1977 16 p refs

(Contract F19628-76-C-0075; ARPA Order 1975)
(AD-A041904; AFGL-TR-77-0106) Avail: NTIS HC A05/MF A01 CSCL 08/11

During the term of this contract, research was carried out in the following areas of interest to the contract: (1) A study of the velocity structure under the Tibetan Plateau using at least ten Tibetan earthquakes recorded by nearby WWSSN stations; (2) A study of causes of variations in Ms/mb relation for a central Asian earthquake sequence. The purpose of the study is to determine what factors other than source depth and focal mechanism control the surface wave magnitude for small events; (3) A study of the distribution of great shallow earthquakes; (4). A study to determine how well data from two or three of the High-Gain, Long-Period (HGLP) Seismograph Stations can prescribe an earthquake; (5) This study involves application of several numerical techniques for calculating theoretical seismograms; and (6) Several studies have been conducted which involve the determination of stress orientation in island arcs from volcanic structures, the role of volcanic eruptions in the time history of major seismic gaps, or the mapping of fine structure within slabs of underthrusting lithosphere. GRA

N77-33730# Stanford Research Inst., Menlo Park, Calif. Molecular Physics Center.
COLLISIONAL DISSOCIATION AND STRUCTURAL PROPERTIES OF ATMOSPHERIC NEGATIVE IONS Final Report, 1 Jul. 1974 - 30 Jun. 1977
John T. Moseley 30 Jun. 1977 24 p refs
(Contract DAHC07-74-C-0031)
(AD-A042111; SRI-MR-77-48; ARO-12590.4-D) Avail: NTIS HC A02/MF A01 CSCL 04/1

The transport properties, collisional dissociation, and photodissociation of N4(+) have been measured. The photodissociation cross section of CO3(-) has been interpreted to yield structural information on this ion, including vibrational frequencies, bond energy and electron affinity. A detailed study of the photodissociation of O2(+)(a 4 Pi u) has been made,) has been made, leading to the discovery of a new state F 4 Pi g), and of new techniques for high resolution spectroscopy of ions. GRA

N77-33731# Naval Research Lab., Washington, D. C.
COMMENTS ON CERTAIN BOUNDARY LAYER PARAMETERIZATION SCHEMES USED IN ATMOSPHERIC CIRCULATION MODELS Interim Report
Tsann-Wang Yu and Rao Madala Jul. 1977 29 p refs
(AD-A042057; NRL-MR-3548) Avail: NTIS HC A03/MF A01 CSCL 04/1

This paper discusses two important processes of boundary layer parameterization for use in general circulation models (GCM). The first process, based on the surface constant flux layer theory, is applicable when the first level of a GCM is placed below the surface layer. The second one, based on the Rossby number similarity and generalized similarity theories, is appropriate when the first level of a GCM is above the entire boundary layer. Observation data taken from the Wangara and Kansas field experiments were used to analyze the effect of varying constant flux layer height (CFL) on the surface fluxes computation. Results of analyses with several cases of CFL effects are discussed. Parameterization of the atmosphere boundary layer by the Rossby number and generalized similarity theories is described, and the computations of boundary layer fluxes by these theories are compared. Author (GRA)

N77-33732# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
POSITIVE IONS IN THE MIDDLE ATMOSPHERE DURING SUNRISE CONDITIONS
J. D. Mitchell (Texas Univ., El Paso), R. S. Sagar (Texas Univ., El Paso), and R. O. Olsen May 1977 20 p refs
(DA Proj. 1L1-61102-B-53A)
(AD-A041799; ECOM-5819) Avail: NTIS CSCL 04/1

Two subsonic Gerdien condenser experiments were recently conducted at White Sands Missile Range, New Mexico, to study upper atmospheric ionization processes during morning twilight conditions. The same instrument was flown on 15 July 1975 at 0618 MST (chi = 75 deg) and 26 September 1975 at 0600 MST (chi = 90 deg). Electrical conductivity data from two subsonic blunt probe experiments (9 June 1971 at 0809 MST (chi = 53 deg) and 28 July 1971 at 0705 (chi = 68 deg) are also included in this study. At 30 km, the positive ion conductivity data for the four flights are generally in good agreement, thus indicating no particular discrepancies due to differences in launch dates or measurement techniques. Above 60 km, the buildup in conductivity with respect to the launch times presumably reflects an increase in positive ion number density associated with solar ultraviolet ionization. The most noticeable buildup, however, occurs between 35 and 60 km where the positive ion conductivity values increase during the early morning period by as much as an order of magnitude (between 45 and 50 km). The Gerdien condenser measurements indicate that this buildup in conductivity is related to an increase in positive ion mobility, thus suggesting the presence during the early morning hours of a solar dependent process for forming smaller, more mobile positive ions. GRA

N77-33733# Weapons Research Establishment, Salisbury (Australia).
UPPER ATMOSPHERE RESEARCH BIBLIOGRAPHY OF CONTAMINANT RELEASE EXPERIMENTS, PART 3
C. H. Low and K. H. Lloyd Mar. 1977 32 p
(AD-A042565; WRE-TM-1788(W)) Avail: NTIS HC A03/MF A01 CSCL 05/2

This is the last in a series listing the publications involving the experimental technique of releasing vapour clouds into the upper atmosphere. All aspects of the technique are included, as are all applications to the determination of neutral atmosphere and ionospheric parameters. GRA

N77-33734# Los Alamos Scientific Lab., N. Mex.
ELECTRON MICROPROBE ANALYSES OF MINERALS IN PRECAMBRIAN ROCKS AT THE LOS ALAMOS SCIENTIFIC LABORATORY GEOTHERMAL TEST SITE, TEMEZ MOUNTAINS, NEW MEXICO
Stephen N. Ehrenberg and Priscilla C. Perkins Feb. 1977 15 p refs
(Contract W-7405-eng-36)
(LA-6695-MS) Avail: NTIS HC A02/MF A01

Electron microprobe analyses are presented for plagioclase, biotite, hornblende, magnetite, microcline, and chlorite in core samples from Granite Test Hole One at the Los Alamos Geothermal Test Site. The analyses and accompanying petrographic descriptions characterize material exposed to artificial hydrothermal systems in laboratory experiments. Plagioclase in granitoid rocks exhibits significant compositional variation (albite rims on calcic oligoclase) and alteration to sericite and epidote. ERA

N77-33735# Los Alamos Scientific Lab., N. Mex.
PRELIMINARY STUDIES OF THE ALTERATION OF A GRANITE BY AN ARTIFICIAL HYDROTHERMAL SYSTEM
S. N. Ehrenberg, P. C. Perkins, and J. Balagna Feb. 1977 18 p
(Contract W-7405-eng-36)
(LA-6696-MS) Avail: NTIS HC A02/MF A01

Solution channels in quartz, microcline, and plagioclase of a granite were produced by exposure of the rock to an artificial hydrothermal system. Electron microprobe analyses, beam scanning photographs, and element profiles showed that the mineral grains were homogeneous and unaltered within a few micrometers of the channels. The channels, appeared to have formed by removal of material in solution. In the sample material, no new minerals produced by alteration or deposition were detected by microprobe analysis. The apparent absence of such alteration products may be due to sample preparation or concentrations of such minerals in such small amounts that they are below the limits of detectability. ERA

N77-33736# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
PROBLEMS RELATED TO MACROSCOPIC ELECTRIC FIELDS IN THE MAGNETOSPHERE
Carl-Gunne Faelthammar Feb. 1977 39 p refs Presented at the Symp. on Magnetosphere and its Environ., Christchurch, New Zealand, 24-28 Jan. 1977
(TRITA-EPP-77-08) Avail: NTIS HC A03/MF A01

A review of the situation in regard to magnetospheric electric fields is presented. The sources of the fields both internal and

due to the solar wind dynamo are considered together with plasma and energy-dependent differential convection especially in the presence of non vanishing E.B. The need for improved electric field models is stressed with regard to energization of particles by electric fields transverse to the magnetic field in adiabatic and nonadiabatic conditions. Current conduction along the geomagnetic field is discussed with regard to anisotropy of trapped electrons or ions, magnetic mirror effect on Birkeland currents, anomalous resistivity and thermoelectric effects. The results of recent observation of high altitude electric fields as regards the items discussed are presented. ESA

N77-33737# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
ELECTRIC FIELD TOPOLOGY NEAR THE DAYSIDE MAGNETOPAUSE
Walter J. Heikkila (Texas Univ., Dallas) Apr. 1977 31 p refs Sponsored in part by Swed. Natural Sci. Res. Council and US NSF
(TRITA-EPP-77-12) Avail: NTIS HC A03/MF A01

A direct test for the occurrence of the reconnection electric field E sub R, tangent to the dayside magnetopause, is possible using in situ spacecraft observations of magnetic field and plasma parameters. One particular pass of HEOS-2, on June 18, 1973, is discussed, although other passes lead to similar conclusions, without exception. The expected energization is about 1 keV per particle, but none is observed. Neither is there any evidence of an enhanced outflow as predicted by reconnection theories. The conclusion is that no reconnection electric field, tangential to the dayside magnetopause, exists; thus, the magnetopause must be very nearly an equipotential surface. The significance of this conclusion, in particular the role of the boundary layer inside the magnetopause, is discussed. Author (ESA)

N77-33738# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
CRITICISM OF RECONNECTION MODELS OF THE MAGNETOPAUSE
Walter J. Heikkila (Texas Univ., Dallas) Apr. 1977 26 p refs Presented at the Symp. on Magnetosphere and its Environ., Christchurch, New Zealand, 24-28 Jan. 1977
(Grant NSF ATM-76-14916)
(TRITA-EPP-77-13) Avail: NTIS HC A03/MF A01

The models are shown to be in contradiction with experimental evidence both on the day and night sides of the magnetosphere. The arguments against the reconnection models are developed with regard to the effects of trapped particles and substorm phenomena. To resolve the paradox it is suggested that electric fields parallel to the magnetic field line should be present on the dawn and dusk side of the magnetosphere with an equipotential dayside magnetopause. ESA

N77-33739# European Space Agency, Paris (France).
MULTIDISCIPLINARY LIDAR SYSTEM IN SPACELAB FOR APPLICATION TO ATMOSPHERIC PHYSICS AND REMOTE SENSING
Wolfgang Englisch (Battelle Inst.), Eberhard Achtermann, Thorstein Halldorsson (MBB, Ottobrunn, West Ger.), Rasmus Beck (Battelle Inst.), Gerhard Lorch, Erhard Wedel, Wolf Wiesemann (Battelle Inst.), and Guenther Wirths Sep. 1977 275 p refs Transl. into ENGLISH of 'Multidisziplinaeres Lidar-System in Spacelab zur Anwend. in Atmosphaerenphys. u. Erderkundung', Dornier System GmbH, Friedrichshafen, West Ger. Report BMFT-FB-W-76-23, Dec. 1976 Original report in GERMAN previously announced as N77-26597 Original German report available from ZLDI, Munich DM 65.95
(ESA-TT-404; BMFT-FB-W-76-23) Avail: NTIS HC A12/MF A01

Possible applications of a lidar system onboard an airplane or onboard Spacelab were studied. The selection of lasers and detection techniques for the different tasks is discussed and intensity calculations are performed. A combination of an aerosol and a trace gas lidar is proposed for the first Spacelab mission. The aerosol lidar uses pulsed lasers, the trace gas lidar a CW-CO2-laser and a heterodyne detecting technique for the differential absorption method in the IR. The telescope of the Spacelab lidar lies within the 1 m class. An airborne lidar puts minor requirements on its subsystems. It is proposed therefore that this should precede the Spacelab lidar so that experience can be obtained with the technical subsystems, and the scientific benefits can be appraised. Author (ESA)

N77-33740# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
SATELLITE INFERRED SURFACE ALBEDO OVER NORTHWESTERN AFRICA M.S. Thesis
Anthony A. Rockwood and Stephen K. Cox Nov. 1976 75 p refs
(Grants NSF OCD-74-21678; NSF OCD-72-01681-A03)
(PB-267835/7; CSU-ATSP-265) Avail: NTIS HC A04/MF A01 CSCL 04A

A technique is developed that allows the albedo of the earth's surface to be inferred from the SMS-1 satellite measurements of the earth-atmosphere system brightness. The technique uses simultaneous satellite and aircraft measurements from the SMS-1 and the NCAR Sabreliner during the GATE in 1974. GRA

N77-33741# Rosenstiel School of Marine and Atmospheric Sciences, Coral Gables, Fla. Div. of Atmospheric Science.
RELATIONSHIP BETWEEN LAKE-INDUCED DISTURBANCES AND SYNOPTIC CIRCULATION Final Report
James M. Gross Dec. 1976 69 p refs
(Grant NOAA-04-5-022-23)
(PB-269406/5; NOAA-77051124) Avail: NTIS HC A04/MF A01 CSCL 04B

A theoretical model is described which is suitable for studying lake induced disturbances for Lake Ontario. The model is based on time dependent, nonlinear primitive equations in the sigma coordinate system, and incorporates parameterizations for vertical and horizontal turbulent eddy fluxes and the release of latent heat. A numerical formulation of the theoretical model was used to conduct a series of sensitivity studies in order to determine the relative importance of various physical processes on development of lake-effect storm. It was found that surface heating alone, causes maximum convergence farther from the lake than when the release of latent heat is included in the computation. GRA

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N77-33742*# Techno-Sciences, Inc., Annapolis, Md.
TORNADO DETECTION DATA REDUCTION AND ANALYSIS Final Report, Jul. 1976 - Jul. 1977
L. D. Davisson Aug. 1977 23 p
(Contract NAS5-23508)
(NASA-CR-152595; TSI-77163) Avail: NTIS HC A02/MF A01 CSCL 04B

Data processing and analysis was provided in support of tornado detection by analysis of radio frequency interference in various frequency bands. Sea state determination data from short pulse radar measurements were also processed and analyzed. A backscatter simulation was implemented to predict radar performance as a function of wind velocity. Computer programs were developed for the various data processing and analysis goals of the effort. Author

N77-33743# Academy of Athens (Greece). Research Center for Astronomy and Applied Mathematics.
SOLAR ACTIVITY AND A GLOBAL SURVEY OF PRECIPITATION
John Xanthakis 1975 171 p refs
Avail: NTIS HC A08/MF A01

The influence of the 11 - year solar cycle on precipitation on a world scale, was studied. The whole of the southern hemisphere of the earth was examined, and the results are proportional to those for the Northern, namely: (1) There are high values of correlation coefficients between the zonal annual precipitation deparature from minimum and the area index, within the high latitude zones; (2) In the equatorial zones the correlation is also high although there are inversions in the phase of the

time series; (3) In the middle latitude zones the correlation is low. The processing of these values indicated the existence of long-term periodic variations (12 to 90 years). Author

N77-33744# Army Electronics Command, White Sands Missile Range, N. Mex. Atmospheric Sciences Lab.
THE 12817A LANCE MISSILE NUMBER 4106, ROUND NUMBER 295 RCL
Apr. 1977 28 p
(AD-A041448; DR-938) Avail: NTIS HC A03/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 12817A Lance, Missile Number 4106, Round Number 295 RCL, are presented in tabular form. Author (GRA)

N77-33745# Army Electronics Command, White Sands Missile Range, N. Mex.
THE 12815C LANCE MISSILE NUMBER 4043, ROUND NUMBER 294 RSL
Jan. 1977 37 p
(AD-A041453; DR-936) Avail: NTIS HC A03/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 12815C Lance, Missile Number 4043, Round Number 294 RSL, are presented in tabular form. Author (GRA)

N77-33746# Army Electronics Command, White Sands Missile Range, N. Mex.
THE 17901AT HONEST JOHN MISSILE NUMBERS 1483/1494 ROUND NUMBERS 656 ASL/658 ASL
Apr. 1977 23 p
(AD-A041449; DR-939) Avail: NTIS HC A02/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 17901AT Honest John, Missile Numbers 1483/1494, Round Numbers 656 ASL/658 ASL, are presented in tabular form. Author (GRA)

N77-33747# Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
ATMOSPHERIC DISPERSION CHARACTERISTICS IN THE LOUISIANA COASTAL ZONE
S. A. Hsu Feb. 1977 34 p refs
(Contract N00014-75-C-0192; NR Proj. 388-002)
(AD-A041099; TR-229) Avail: NTIS HC A03/MF A01 CSCL 04/2

Atmospheric dispersion characteristics in the coastal zone are unique in that physical processes of air, sea, and land combine at the shoreline to create motions on many scales which differ in important respects from processes over land or over water. Some of these differences in coastal Louisiana are reviewed. Synoptic-scale characteristics indicate that the coastal zone is superior to areas farther inland for dispersing pollutants. However, mesoscale and microscale studies reveal that diurnal circulation of land-breeze and sea-breeze systems and the development of an internal boundary layer because of aerodynamic roughness changes across the shoreline may actually increase pollution concentration in the nearshore region. Specific studies on these scales of atmospheric motion in relation to the optimum siting for industrial plants are outlined and recommended.
Author (GRA)

N77-33748# Naval Postgraduate School, Monterey, Calif.
STATISTICAL DIAGNOSTIC MODELING OF MARINE FOG USING MODEL OUTPUT PARAMETERS M.S. Thesis
Brian L. VanOrman and Robert J. Renard Jun. 1977 95 p refs
(ZF52551713)
(AD-A042059; NPS-63RD77061) Avail: NTIS HC A05/MF A01 CSCL 04/2

Diagnostic model output parameters, provided by the Fleet Numerical Weather Central, Monterey, Calif. (FNWC), and the marine fog frequency climatology developed at the Naval Postgraduate School, are statistically processed in context with marine surface synoptic ship reports in order to develop a linear regression scheme to model distribution of marine fog. The study area includes a large section of the North Pacific Ocean (from 30-60N) at 0000 GMT, 1-30 July 1976. The diagnostic capabilities of the regression equations are analyzed through the use of three verification scoring systems. Improvement over climatology and FNWC's operational fog probability program (FTER), is demonstrated. Selective mappings of the regression equation outputs and categorized observations are intercompared with the sea-level pressure analysis; FTER; and the evaporative heat flux--the most significant predictor parameter. GRA

N77-33749# Naval Postgraduate School, Monterey, Calif.
A NUMERICAL EXPERIMENT OF THE DEVELOPMENT OF THE ZONALLY SYMMETRIC NORTHERN SUMMER MONSOON M.S. Thesis
Wayne Lynn Patterson Jun. 1977 37 p refs
(AD-A042103) Avail: NTIS HC A03/MF A01 CSCL 04/2

The sudden onset of the northern summer monsoon has led to many theories as to the cause, one of these being a possible relation to the elevated Tibetan highland that dominates the area. Using a zonally symmetric numerical model driven by a specified equilibrium heating function, two experiments are conducted. The first experiment integrates the model over a 180-day period on a flat earth, linearly changing the equilibrium temperature from January to July. The second experiment repeats the first except for the inclusion of the topography of 85 deg E longitude. In both experiments, actual velocities are underestimated with the topography experiments providing the better results. Development of the monsoon was poor in both experiments, due mainly to the inability of the model's vertical resolution to simulate the extreme change in topography elevation and the unrealistic approach of a linear temperature change. Possible improvements for future studies are suggested.
Author (GRA)

N77-33750# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex. Atmospheric Sciences Lab.
CALIBRATION TECHNOLOGY FOR METEOROLOGICAL SATELLITES
L. Edwin Williamson Jun. 1977 150 p
(AD-A041662; Mono-Ser-3) Avail: NTIS HC A07/MF A01 CSCL 04/2

The focus of this study is the meteorological satellite and the data derived therefrom. The assurance of data quality acquired by sensors which are located hundreds of miles away, and accessible only after radio transmission and various other electronic or other manipulations, should not readily be taken for granted. The integration of information from multiple sources can produce confusion. This report addresses the problem of determination of the quality of the data provided by these systems. Ideally the user should be able to compare the observation from instrument a to instrument b; from satellite A to satellite Z; and from the first day in the operational life of the system to its last day. This report describes the steps involved in providing this total system calibration and a description of the multitude of effects that can interfere with it. Total system calibration must include full-life-cycle application of calibration techniques as most factors affecting equipment performance contain or produce time-dependent responses and surface radiation characteristics. GRA

N77-33751# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
A SIMULATED MISSION SUCCESS INDICATOR FOR USE WITH PROBABILITY FORECASTS AT TRAVIS AFB, CALIFORNIA
Gary E. OConnor and Murray J. Young Apr. 1977 13 p
(AD-A041880; USAFETAC-8088B) Avail: NTIS HC A02/MF A01 CSCL 04/2

Using a simulated mission success indicator along with a probability forecast of cloud ceiling and visibility at a later time, one can base an operational decision on the chance for success. This report describes the use of this tool for Travis AFB, California. Author (GRA)

N77-33752# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
REFORGER 77 SUPPORT. PART B: TEST OF A SUGGESTED APPROACH TO SPREADING CLIMATOLOGY TO GRID POINTS
Murphy J. Young Mar. 1977 37 p refs
(AD-A041879; USAFETAC-8065B) Avail: NTIS HC A03/MF A01 CSCL 04/2

The maximum difference between observed climatology for pairs of closely spaced stations is used to test the hypothesis that the climatology is the same for the pairs and thus climatology at one station could be used to predict climatology at a nearby point. The hypothesis was not proven true in all samples. Ceiling and visibility summaries were used for the test. Author (GRA)

N77-33753# National Weather Service, Silver Spring, Md. Techniques Development Lab.
AUTOMATED PREDICTION OF THUNDERSTORMS AND SEVERE LOCAL STORMS
Ronald M. Reap and Donald S. Foster Apr. 1977 28 p refs (PB-268035/3; NOAA-TM-NWS-TDL-62; NOAA-77042902) Avail: NTIS HC A03/MF A01 CSCL 04B

Operational probability equations were developed for predicting general thunderstorm activity and more localized severe weather such as tornadoes, large hail, and damaging winds for period up to 36 hours in advance. The statistical equations were derived by applying multiple screening regression techniques to predictors forecast by operational numerical models and to predictions tabulated from manually-digitized radar data and severe local storm reports. Generalized forecast equations were developed to give thunderstorm probabilities for the April to September convective season. Key predictors in the thunderstorm equations were the stability and vertical motion fields below 700 mb and the boundary-layer wind field. GRA

N77-33754# National Weather Service, Silver Spring, Md.
OPERATIONS OF THE NATIONAL WEATHER SERVICE
Jan. 1977 294 p
(PB-268041/1; NOAA-77042907) Avail: NTIS HC A13/MF A01 CSCL 04B

The operating system of the National Weather Service is described. Meteorological, hydrological, and oceanographic operations are analyzed in detail. I.M.

N77-33755# National Oceanic and Atmospheric Administration, Boulder, Colo. Data Service.
MARINERS WEATHER LOG, VOLUME 21, NUMBER 2
Elwyn E. Wilson Mar. 1977 78 p
(PB-268219/3; NOAA-77042603) Avail: NTIS HC A05/MF A01 CSCL 04B

Meteorological data gathered by NOAA satellites are presented. In addition to its regular sections this issue contains the following articles: North Atlantic tropical cyclones, 1976; Winter of extremes as viewed from NOAA satellites; Possibly coldest winter on record; Ice conditions on the Hudson River; Severe weather halts most Great Lakes traffice; and Guam as a typhoon haven. GRA

N77-33756# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
FORMULATION OF APPROXIMATE EQUATIONS FOR MODELING MOIST DEEP CONVECTION ON THE MESOSCALE
M. J. Manton and W. R. Cotton Mar. 1977 74 p refs (Grant NSF DES-75-13310)
(PB-267592/4; AS-Paper-266) Avail: NTIS HC A04/MF A01 CSCL 04A

A set of approximate equations describing deep convection in a moist atmosphere is derived. Liquid water is parameterized into only two categories: cloud water and rain. It is shown that the natural dependent variable appearing in the equation for the conservation of energy is the potential temperature. Arguments are used to obtain a parameterization scheme for the precipitation in mesoscale convective models. The liquid water is divided into two categories: cloud water and rain. The physical basis of the Marshall-Palmer spectrum is discussed in order to predict the parameters associated with rain drops. GRA

N77-33757# Central Studies Establishment, Canberra (Australia).
SIMULATION AND ANALYSIS OF A TROPICAL CYCLONE WARNING SYSTEM
J. W. Moll and A. J. Donohoe Mar. 1977 71 p refs (AD-A042659; CSE-Note-42) Avail: NTIS HC A04/MF A01 CSCL 04/2

An empirical mathematical model of the Tropical Cyclone Warning System was developed to investigate the potential benefits of improvement to the cyclone measurement system. It was found that the model indicated little sensitivity in warning 'quality' (defined in broad terms) to improvements in some aspects of the cyclone observation system. Despite this lack of sensitivity, the assumption of U.S. cost figures applicable to communities affected by cyclones produces a result favourable to participation in the Japanese Geostationary Meteorological Satellite program. Areas of weakness in the model have been identified as requiring attention in any continuing program of work in this field. Author (GRA)

N77-33758# National Weather Service, Fort Worth, Tex.
AN EXAMINATION OF PROBABILITY OF PRECIPITATION FORECASTS IN LIGHT OF RAINFALL AREAL COVERAGE
Daniel L. Smith (National Weather Service Forecast Office, Birmingham, Ala.) Apr. 1977 27 p
(PB-268761/4; NOAA-TM-NWS-SR-89; NOAA-77051908) Avail: NTIS HC A03/MF A01 CSCL 04B

Composites at 12 hour intervals of weather radar echoes were used to derive estimates of rainfall coverage in forecast zones of southern Alabama and northwest Florida. Coverage estimates were compared with probability of precipitation (PoP) forecasts to assess the skill and reliability shown by the forecasts. In addition, it was shown that area coverage and PoP forecasts are closely related and a knowledge of the former, in real time, could lead to improved forecasts. GRA

N77-33759# National Weather Service, Silver Spring, Md. Office of Hydrology.
GREATEST KNOWN AREAL STORM RAINFALL DEPTHS FOR THE CONTIGUOUS UNITED STATES
Albert P. Shipe and John T. Riedel Dec. 1976 184 p refs (PB-268871/1; NOAA-TM-NWS-HYDRO-33; NOAA-77052501) Avail: NTIS HC A09/MF A01 CSCL 04B

The greatest known areal storm rainfall depths for the contiguous United States are presented for the winter, spring, summer, and fall seasons. The depths are for 100, 200, 1000, 5000, and 10,000 square miles (259, 518, 2590, 12,950, 25,900 sq km.) for 6, 12, 24, and 48 hours. The rainfall values are given on maps and identified on adjacent tables. GRA

N77-33760# National Weather Service, Fort Worth, Tex.
A COMPARISON OF THE FREQUENCY DISTRIBUTION OF FOUR-HOUR TOTALS OF MANUALLY DIGITIZED RADAR DATA WITH FLOODING OVER A PORTION OF THE SOUTHEASTERN UNITED STATES
May 1977 29 p
(PB-268872/9; NOAA-TM-NWS-SR-90; NOAA-77052002) Avail: NTIS HC A03/MF A01 CSCL 04B

A frequency distribution of four-hour totals of Manually Digitized Radar (MDR) data was developed from twelve months of data for a portion of the southeastern United States. This distribution was developed in ten categories of four-hour MDR totals for 98 grid squares under the surveillance of ten radars. The variations in the frequency distribution are examined for the radar range effect, seasonal changes and for variations associated with topography. The frequency distribution is compared with the maximum four-hour MDR totals associated with flooding. A radar-derived precipitation frequency was also developed and areas of poor radar detection of precipitation are identified. Suggestions are made for improving radar estimates of precipitation; especially over mountainous areas. GRA

N77-33761# Bonn Univ. (West Germany). Inst. fuer Meteorologie.
CHANGES IN THE COMPOSITION OF THE ATMOSPHERE AND THEIR IMPACT UPON CLIMATIC VARIABILITY: AN OVERVIEW
Wilfrid Bach Ferd. Duemmlers Verlag 1976 53 p refs Presented at the Seminar at Climatic Res. Unit School of Environ. Sci., Univ. of East Anglia, Norwich, Engl., Mar. 1976
(BMA-24; ISBN-3-427-7584-19) Avail: NTIS HC A04/MF A01; Ferd. Duemmler Verlag DM 22

Input information in the troposphere and in the stratosphere relevant to the problem of climate variability is reviewed. The atmospheric influence of air pollutants is emphasized, along with some aspects of climatic change. Particular attention is given to global pollutant emission estimates. Changes in the

upper atmosphere are discussed relative to the impact of aerosols, carbon dioxide, heat, and land use changes. The potential development of the climate throughout the next century is hypothesized. ESA

N77-33762# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.

ON THE USE OF FINITE TAYLOR'S SERIES APPROXIMATIONS TO CERTAIN EXPONENTIAL AND POWER FUNCTIONS EMPLOYED IN CLOUD MODELS

Russell G. Derickson and William R. Cotton Apr. 1977 27 p refs

(Grants NSF ERT-71-01885-A03; NSF DES-75-13310)

(PB-267834/0; SU-ATSP-268) Avail: NTIS HC A03/MF A01 CSCL 04B

Poisson's equation for temperature and Murray's (1967) equation for saturation vapor pressure both can be replaced by an appropriate finite Taylor's series to produce computationally faster methods of solution. In the case of saturation vapor pressure, a Taylor's series of the standard Goff-Gratch equation results in increased accuracy as well as greater speed over Murray's formulation. It is suggested that other expressions commonly found in meteorological applications can be similarily replaced for increased speed with possible gains in accuracy as well. GRA

N77-33763# National Weather Service, Salt Lake City, Utah. Western Region.

MOISTURE DISTRIBUTION MODIFICATION BY UPWARD VERTICLE MOTION

Ira S. Brenner Apr. 1977 25 p refs

(PB-268740/8; NOAA-TM-NWS-WR-118; NOAA-77052703) Avail: NTIS HC A02/MF A01 CSCL 04B

The coverage and intensity of Arizona's daily thunderstorm activity were investigated. Increases in thunderstorm activity can frequently be attributed to decreasing stability, as well as increasing precipitable water, mixing ratio, and relative humidity due to upward vertical motion commonly associated with positive vorticity advection. It has been found that dry air, undergoing weak upward vertical motion, can easily become saturated at middle and upper levels in slightly over 24 hours. A case study during which these processes were actively engaged is presented. GRA

N77-33764# National Oceanic and Atmospheric Administration, Boulder, Colo. Weather Modification Program Office.

COMPUTER SOFTWARE FOR THE ASSESSMENT OF GROWTH HISTORIES OF WEATHER RADAR ECHOES

Victor Wiggert, Stellan S. Ostlund, Gloria J. Lockett, and John V. Stewart Nov. 1976 93 p refs

(PB-268753/1; NOAA-TM-ERL-WMPO-35; NOAA-77051812) Avail: NTIS HC A05/MF A01 CSCL 04B

Two computer programs are described. One is an echo isolation and tracking program called PEAKS, which fits a bivariate normal distribution to each echo, and also to each relative maximum in rain rate within each echo's perimeter. After a whole day's data has been processed with the tracking program, all tracked echo information is transferred to the second computer program named STATS. It formulates hourly and whole day summaries of South Florida echo areas and rain volumes for all combinations of location (land/sea/both) and status (unmerged/merged/all). Regression equations for these combinations are created and histograms can be displayed. Author

N77-33765# North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.

DEVELOPMENT OF A HYDROLOGIC INFORMATION STORAGE AND RETRIEVAL SYSTEM

E. H. Wiser Jun. 1975 31 p refs Presented at the 1975 Ann. Meeting ASAE, Davis, Calif., 22-25 Jun. 1975

(Contract DI-14-31-0001-5033)

(PB-268792/9; W77-08609; OWRT-A-067-NC(2)) Avail: NTIS HC A03/MF A01 CSCL 04B

A computer system for storage, retrieval, and processing of hydrologic, climatological, and related data has been developed. The system is known as HISARS (Hydrologic Information Storage and Retrieval System). System characteristics and capabilities are outlined. Data stored in the system include daily streamflow records, daily rainfall records, daily temperature records, hydrographic records of streamflow and rainfall, hourly rainfall records, daily evaporation and wind movement records, daily snowfall and snow depth records, daily event ('days with') records, annual flood peak records, dam characteristics, environmental resources, and water temperature records (evaporation pans). GRA

N77-33766# National Oceanic and Atmospheric Administration, Washington, D. C. Center for Experiment Design and Data Analysis.

US NATIONAL PROCESSING CENTER FOR GATE: B-SCALE SURFACE METEOROLOGICAL AND RADIATION SYSTEM, INCLUDING INSTRUMENTATION, PROCESSING, AND ARCHIVED DATA

Ward R. Seguin, Paul Sabol, Raymond B. Crayton, Richard S. Cram, and Kenneth L. Echternacht Apr. 1977 100 p refs

(PB-268816/6; NOAA-TR-EDS-22; NOAA-77051907) Avail: NTIS HC A05/MF A01 CSCL 04B

The surface meteorological and radiation data collected on the four U.S. B-Scale ships Researcher, Gilliss, Dallas, and Oceanographer are documented. The sensors and recording systems on board the ships, pre- and post-calibration procedures, and data processing and validation methods are described. A description and inventory of the archived products are included. GRA

N77-33767# National Oceanic and Atmospheric Administration, Washington, D. C. Center for Experiment Design and Data Analysis.

GATE CONVECTION SUBPROGRAM DATA CENTER: COMPARISON OF SHIP-SURFACE, RAWINSONDE, AND TETHERED SONDE WIND MEASUREMENTS

Chester F. Ropelewski and Robert W. Reeves Apr. 1977 31 p refs

(PB-268848/9; NOAA-TR-EDS-21; NOAA-77051110) Avail: NTIS HC A03/MF A01 CSCL 04B

Comparisons are made of wind data obtained from instruments aboard U.S. ships, from rawinsondes, and from tethered sondes during the GARP Atlantic Tropical Experiment (GATE). Results of comparison between winds derived from radar-tracking of rawinsondes on the VANGUARD with those obtained from tethered sondes aboard the DALLAS indicate the feasibility of using tethered sonde data to supplement rawinsonde measurements in the lowest kilometer. Vorticity and divergence computations based on ship-surface, rawinsonde, and tethered sonde data covering a triangle formed by the U.S. ships OCEANOGRAPHER, RESEARCH, and DALLAS, are evaluated. GRA

N77-33768# National Environmental Satellite Service, Washington, D. C.

ATLANTIC TROPICAL AND SUBTROPICAL CYCLONE CLASSIFICATION FOR 1976

D. C. Gaby, J. B. Lushine, B. M. Mayfield, S. C. Pearce, K. O. Poteat, and F. E. Torres Apr. 1977 21 p refs

(PB-269674/8; NOAA-TM-NESS-87; NOAA-77052401) Avail: NTIS HC A02/MF A01 CSCL 04B

Estimates of locations and maximum sustained winds of all tropical and subtropical cyclones in the North Atlantic Ocean, the Caribbean Sea, and the Gulf of Mexico were made. The estimates were compared with the National Hurricane Center's 'best tracks' data to establish the measure of accuracy achieved. The average difference between satellite locations and best track locations was approximately 17 nautical miles with a standard deviation of about 14 nautical miles. The accuracy in estimating the maximum sustained wind showed an average absolute difference of about 8 knots, an average algebraic difference of minus 4 knots, and a standard deviation of about 9 knots. GRA

N77-33769# National Oceanic and Atmospheric Administration, Boulder, Colo. Weather Modification Program Office.

RAINDROP SIZE DISTRIBUTIONS AND Z-R RELATIONSHIPS MEASURED ON THE NOAA DC-6 AND THE SHIP RESEARCHER WITHIN THE GATE B-SCALE ARRAY

John B. Cunning and Robert I. Sax Apr. 1977 144 p refs

(PB-269659/9; NOAA-TM-ERL-WMPO-37; NOAA-77060202) Avail: NTIS HC A07/MF A01 CSCL 04B

Drop size distributions obtained by both an airborne foil impactor and a shipborne distrometer are discussed. An analysis of the relationship between radar reflectivity and rainfall rate within the GATE B-scale array is provided. Discussion of the use of a cumulative distribution function to transform drop spectra derived from the foil data is offered in an appendix. Alleviation of sampling volume problems occurring at the large end of the drop size distribution is possible through this technique. GRA

N77-33770# National Oceanic and Atmospheric Administration, Washington, D. C. Center for Experiment Design and Data Analysis.

US NATIONAL PROCESSING CENTER FOR GATE: B-SCALE PRECIPITATION DATA

Ward R. Seguin and Raymond B. Crayton Apr. 1977 410 p (PB-270222/3; NOAA-TR-EDS-23; NOAA-77062711) Avail: NTIS HC A18/MF A01 CSCL 04B

Precipitation data obtained in 1974 aboard the U.S. B-scale ships during the GARP Atlantic Tropical Experiment are presented. Tabulations include precipitation as measured by siphon rain gages mounted on the masts, and recorded in standard World Meteorological Organization marine logs; automatically recorded data obtained with gages mounted on the masts and bow booms; and supplementary rainfall measurements made with plastic gages. GRA

N77-33771# National Weather Service, Silver Spring, Md. Techniques Development Lab.

ANALYSIS OF COOL SEASON LAKE-RELATED MESOSCALE PHENOMENA USING NUMERICAL VARIATIONAL ANALYSIS Final Report

Thomas H. Grayson Dec. 1976 177 p refs (PB-269619/3; NOAA-77050906) Avail: NTIS HC A09/MF A01 CSCL 04B

An analysis model was used to describe the fields of atmospheric motion, temperature and specific humidity over Lake Ontario during the invasion of the lake by an Arctic air mass. Times chosen were when the leading edge of the cold air mass was encroaching upon the lake, and 15 hours later, when the air mass completely filled the lake basin. Surface and upper air data collected were interpolated to surface extending to 500 mb. The weak constraint variational formulation was used with variable weights assigned to the interpolated data. The analyses show that the cold surge was accompanied by three lines of organized convective activity over the lake. GRA

N77-33772# Oklahoma Univ., Norman. Dept. of Meteorology.

A NUMERICAL STUDY OF THE DIURNAL VARIATION OF THE LOW-LEVEL JET Final Report

Len-Fu Walter Chang Dec. 1976 124 p refs (Grant NCAA-04-6-022-44002) (PB-269484/2; NOAA-77051118) Avail: NTIS HC A06/MF A01 CSCL 04B

Southerly flow over the eastern slope of the Rocky Mountains under the influence of a diurnal surface temperature wave is studied by numerical experiments and by analytic methods. The diurnal variation of the momentum field and the evolution of the low-level jet is characterized by a significant increase of wind shear in both directions. The mechanisms which are responsible for this two-dimensional low-level jet are the self-organization processes of the turbulent boundary layer. The vertical motion field (and low-level convergence) is found to be closely related to the processes associated with the formation of the low-level jet. The maximum amplitude of this field occurs in th early evening hours, and internal gravity waves are excited during this period. GRA

N77-33773# Oklahoma Univ., Norman. Dept. of Meteorology.

A SEVERE STORM FORECAST AND INTERCEPT PROJECT Final Report

J. Kimpel, L. Ruthi, B. Smull, S. George, C. Sohl, S. Young, H. Crowther, and R. Garvin Dec. 1976 66 p refs (Grant NOAA-04-6-022-44024) (PB-269485/9; NOAA-77051122) Avail: NTIS HC A04/MF A01 CSCL 04B

Parameters important to improving the issuance of severe thunderstorm/tornado watches and warnings to the general public were addressed. Areas studied included a test of an objective forecast technique and the documentation of severe thunderstorms intercepted by mobile 'chase' teams. Conventional forecast methods were supplemented by computerized output of objectively determined quantities of parameters important in severe storm development. The quality of the resulting forecasts is evident in the large number of severe storms successfully intercepted by the chase team. GRA

N77-33774# Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.

METEOROLOGICAL FORCING FIELDS OF THE NEW YORK BIGHT Progress Report

Christopher N. K. Mooers (Delaware Univ., Lewes), Jose Fernandez-Partagas, and James F. Price 30 Nov. 1976 156 p refs (Grant NOAA-04-6-022-44010) (PB-269442/0; TR-76-8; NOAA-77051123; PR-1) Avail: NTIS HC A08/MF A01 CSCL 04B

Meteorological disturbances over the Bight, extratropical cyclones, and sea-air exchanges related to the model extratropical cyclones are reported. Information is given on the data base, the Middle Atlantic Grid, the use of spectrum and correlation analysis and the objective hindcast. The dominant meteorological disturbances are sufficiently well organized, and the network of meteorological stations is sufficiently dense in space and time, that objective hindcasts are feasible for surface atmospheric pressure and wind stress over the Middle Bight, at least for estimating meteorological forcing of the waters of the Bight. GRA

N77-33775# National Center for Atmospheric Research, Boulder, Colo.

WEATHER FORECASTING AND WEATHER FORECASTS: MODELS, SYSTEMS AND USERS. VOLUME 2: NOTES FROM A COLLOQUIUM Final Colloquium Notes

Allan Murphy and David Williamson 1976 461 p refs Colloquium Held at Boulder, Colo., Summer 1976 (Contract NSF C-760) (PB-268914/9; NCAR/CQ-5/1976-ASP-2-Vol-2) Avail: NTIS HC A20/MF A01 CSCL 04B

For abstract, see N77-33776.

N77-33776# National Center for Atmospheric Research, Boulder, Colo.

WEATHER FORECASTING AND WEATHER FORECASTS: MODELS, SYSTEMS, AND USERS. VOLUME 1: NOTES FROM A COLLOQUIUM Final Colloquium Notes

Allan Murphy and David Williamson 1976 458 p refs Colloquium Held at Boulder, Colo., Summer 1976 (Contract NSF C-760) (PB-268913/1; NCAR/CQ-5/1976-ASP-1-Vol-1) Avail: NTIS HC A20/MF A01 CSCL 04B

This two volume publication contains notes based upon a nine-week colloquium held at the National Center for Atmospheric Research. The program consisted of lectures and seminars on weather forecasting and weather forecasts and focused on four topics: (1) the fundamentals of large scale numerical weather prediction; (2) initial data and related practical aspects of weather forecasting; (3) statistical-numerical weather forecasting, including the translation of the output of numerical models into weather forecasts; and (4) the economic and social impact of weather forecasts. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N77-33777 Columbia Univ., New York.

A STUDY OF THE INTERMEDIATE AND LONG WAVELENGTH GRAVITY FIELD OF THE WORLDS OCEANS Ph.D. Thesis

James Randolph Cochran 1977 226 p Avail: Univ. Microfilms Order No. 77-14790

Surface-ship gravity measurements were used to obtain 1 degree x 1 degree and 5 degree x 5 degree average free-air gravity anomalies in the North Atlantic Ocean and Norwegian-Greenland Sea. The main features of the regional gravity field are a large area of very negative anomalies in the western basin and a broad high over the Mid-Atlantic Ridge. The negative anomaly in the western North Atlantic has no expression in the residual depth anomalies and does not appear to be related to surface features. The gravity anomalies across the Mid-Atlantic Ridge are similar to those found over other mid-ocean ridges and can be explained by a simple model similar to those used to explain the topography of mid-ocean ridges. There is a distinct boundary in both gravity and depths at about 32 deg N. North of that latitude the gravity field is characterized by large positive values which are nearly constant along isochrons. Three-dimensional spherical Earth models were used to investigate compensated mass distributions which could explain the observed gravity and depth anomalies. Dissert. Abstr.

N77-33778# Naval Postgraduate School, Monterey, Calif.
DESIGN OF AN ELECTROHYDRAULIC WAVE FOLLOWER SYSTEM M.S. Thesis
Michael Daley Jun. 1977 78 p refs
(AD-A042317) Avail: NTIS HC A05/MF A01 CSCL 08/3

A system for mass-flow measurement in supersonic boundary layers has been examined. The mass flow is evaluated from measurements of pressure derivatives in a closed volume under controlled temperature conditions. Measurements of boundary-layer properties have been made with the probe side by side with the AVA combined pressure-temperature probe in the FFA Hyp 500 wind tunnel. The mass flows measured with the new system were compared with the mass flows calculated from measurements of stagnation temperature and stagnation pressure with the AVA probe. The results agree within the expected limit of accuracy. GRA

N77-33779# National Weather Service, Silver Spring, Md. Oceanographic Services Branch.
GULFSTREAM: MONTHLY PUBLICATIONS, JANUARY-DECEMBER 1976. VOLUME 2, NUMBERS 1-12 Monthly Report
Diane Moravek, ed. 1976 87 p refs
(PB-268216/9; NOAA-76071404) Avail: NTIS HC A05/MF A01 CSCL 08C

Selected satellite imageries from the NOAA-4 satellite are presented. The satellite imageries show gulf stream activity. The data included generally gives information on bathythermograph data and sea furface temperatures. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N77-33780*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
BIOMEDICAL RESULTS FROM SKYLAB
Richard S. Johnston, ed. and Lawrence F. Dietlein, ed. Washington 1977 502 p refs Original contains color illustrations
(NASA-SP-377; LC-76-54287) Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

Biomedical data from various experiments and observations reflect the physiological responses of spacecrews to prolonged space flight stress. For individual titles, see N77-33781 through N77-33836.

N77-33781*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB MEDICAL PROGRAM OVERVIEW **c52**
Richard S. Johnson *In its* Biomed. Results from Skylab 1977 p 3-19 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

The following major medical subsystems in Skylab are outlined: (1) operational equipment; (2) life science experiments; (3) medical operations; and (4) operational experience. Throughout the Skylab flight program, alterations in equipment and procedures were made for each succeeding mission to capitalize on the flight experience of the previous mission. G.G.

N77-33782*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FLIGHT CONTROL EXPERIENCES **c54**
F. Story Musgrave *In its* Biomed. Results from Skylab 1977 p 20-21 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 05H

A multidisciplinary medical-management team at mission control provided Skylab crew support by monitoring health, retrieving and compiling experimental data, assisting in the development of flight plans, and by contributing to in-flight procedures and checklists. Real time computers assisted the flight crews in performing medical and other experiments. G.G.

N77-33783*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB 4 CREW OBSERVATIONS **c52**
Edward G. Gibson *In its* Biomed. Results from Skylab 1977 p 22-26 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

Comments on food, exercise, scheduling, medical training, the effect of fluid shift, and vestibular phenomena are briefly reported. A ballistocardiographic effect of around 60 beats per minute was observed several times for the whole Skylab cluster. Also experienced were light flashes that were well correlated with the South Atlantic anomaly. G.G.

N77-33784*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB 2 CREW OBSERVATIONS AND SUMMARY **c52**
Joseph P. Kerwin *In its* Biomed. Results from Skylab 1977 p 27-29 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06S

Signs and symptoms experienced during weightlessness ranged from a sensation of fullness in the head to a strange body posture and the sensation of fluid drainage out of the legs. There was no vestibular sense of the upright whatsover unless the crewmember happened to look at the earth; motion sickness was not a clinical problem. The ability to maintain physical fitness through exercise and the caloric demand remained just about the same as they do on the ground after initial adjustment. G.G.

N77-33785*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB CREW HEALTH: CREW SURGEON'S REPORT **c52**
Jerry R. Hordinsky *In its* Biomed. Results from Skylab 1977 p 30-34 ref (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

Medical examinations and treatment of crewmen preflight, during Skylab missions, and postflight periods are outlined. From a clinical point of view, all of the physiological responses noted in the various missions were either self-limiting or represented work-around problems requiring minimal counteraction. As such, these changes do not preclude extending man's duration in zero-gravity for longer periods of time. G.G.

N77-33786*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB ORAL HEALTH STUDIES **c52**
Lee R. Brown (Tex. Univ., Houston), William J. Frome, Sandra Handler (Tex. Univ., Houston), Merrill G. Wheatcroft (Tex. Univ., Houston), and Linda J. Rider (Tex. Univ., Houston) *In its* Biomed. Results from Skylab 1977 p 35-44 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06E

Evaluation of Skylab crewmembers for mission related effects on oral health in relation to possible dental injuries provided the following distinctive changes: (1) increased counts of specific anaerobic and streptococcal components; (2) elevations in levels

of secretory IgA concurrent with diminutions of salivary lysozyme; and (3) increases in dental calculus and gingival inflammations. The clinical changes are considered to be more influenced by the preexisting state of dental health than by any mission related effects. G.G.

N77-33787*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ANALYSIS OF THE SKYLAB FLIGHT CREW HEALTH STABILIZATION PROGRAM **c52**
J. Kelton Ferguson, Gary W. McCollum (Public Health Service, Atlanta), and Benjamin L. Portnoy *In its* Biomed. Results from Skylab 1977 p 45-52 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06E

Isolation periods were established prior to launch as well as postflight in order to reduce the number of infectious illness contacts between crewmen. The most frequently reported illness contacts were upper respiratory infections. Enteric illnesses represented the next most common illness, but these were relatively rare compared to upper respiratory infections. G.G.

N77-33788*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB ENVIRONMENTAL AND CREW MICROBIOLOGY STUDIES
Gerald R. Taylor, Richard C. Graves, Royce M. Brockett (School of Aerospace Med.), J. Kelton Ferguson, and Ben J. Mieszkuc *In its* Biomed. Results from Skylab 1977 p 53-63 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

Microbial flora samples were collected from crewmembers before, during, and after missions in order to obtain data on the microbial response to space flight environment. Data showed that, while gross contamination of the Skylab environment was demonstrated and there were several in-flight disease events, such events are not limiting hazards for long term manned space flights. Intercrew transfer of pathogens was demonstrated, but evidence of postflight microbial shock was not found. G.G.

N77-33789*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
RADIOLOGICAL PROTECTION AND MEDICAL DOSIMETRY FOR THE SKYLAB CREWMEN **c52**
J. Vernon Bailey, Rudolf A. Hoffman, and Robert A. English *In its* Biomed. Results from Skylab 1977 p 64-69 refs (For primary document see N77-33780 24-51)
Avail: NTIS CSCL 06R

Dosimetry results for Skylab crewmembers show that the Skylab 4 crewmen received the highest dose equivalents but remained well within the established limits for Skylab missions below the threshold of significant clinical effects. These dose equivalents apply specificially to long term effects such as general life shortening, increased neoplasm incidence, and cataract production. A Skylab crewman could fly a mission comparable to one 84-day Skylab 4 mission per year for 50 years before exceeding these career limits. G.G.

N77-33790*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
TOXICOLOGICAL ASPECTS OF THE SKYLAB PROGRAM **c52**
Wayland J. Rippstein, Jr. and Howard J. Schneider *In its* Biomed. Results from Skylab 1977 p 70-72 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06T

A current state-of-the-art trace gas removal technology is demonstrated that provides for carbon monoxide removal through an outgassing screening program for nonmetallic materials of the Skylab cabin interior. Material selection included both outgassing data and LD sub 50 information, as well as chemical analyses on pyrolysis products to prevent toxic inhalation exposures of spacecrews. G.G.

N77-33791*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXPERIMENT M131. HUMAN VESTIBULAR FUNCTION **c52**
Ashton Graybiel (Naval Aerospace Med. Res. Lab., Pensacola, Fla.), Earl F. Miller, II (Naval Aerospace Med. Res. Lab., Pensacola, Fla.), and Jerry L. Homick *In its* Biomed. Results from Skylab 1977 p 74-103 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

The lower susceptibility to vestibular stimulation aloft, compared with that on ground under experimental conditions, is attributed to a precondition, namely, either there is no need to adapt, or, as exemplified by the Skylab 3 pilot, adaptation to weightlessness is achieved. Findings in some of the astronauts emphasize the distinction between two categories of vestibular side effects: immediate reflex phenomena (illusions, sensations of turning, etc.), and delayed epiphenomena that include the constellation of symptoms and syndromes comprising motion sickness. The drug combinations 1-scopolamine and d-amphetamine and promethazine hydrochloride and ephedrine sulfate are effective in prevention and treatment of motion sickness. It is concluded that prevention of motion sickness in any stressful motion environment involves selection, adaptation, and the use of drugs. Author

N77-33792*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE EFFECTS OF PROLONGED EXPOSURE TO WEIGHTLESSNESS ON POSTURAL EQUILIBRIUM **c52**
Jerry L. Homick, Millard F. Reschke, and Earl F. Miller, II *In its* Biomed. Results from Skylab 1977 p 104-112 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06S

A postflight postural equilibrium rail test on spacecrews was used to prove a pronounced decrement in ability to maintain an upright posture after prolonged exposure to weightlessness. Support for the hypothesis that central neural reorganization occurs in response to environmental change is obtained when postflight decrease in stability on the rails and the time course for recovery are compared with preflight performance. G.G.

N77-33793*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXPERIMENT M133. SLEEP MONITORING ON SKYLAB **c52**
James D. Frost, Jr. (Baylor Coll. of Med.), William H. Schumate, Joseph G. Salamy (Technol., Inc., Houston), and Cletis R. Booher *In its* Biomed. Results from Skylab 1977 p 113-126 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

Subjective sleep logs during 59-day and 84-day Skylab missions indicate that prolonged space flight, with its accompanying weightless state, is not directly associated with major adverse changes in sleep characteristics. Observed alterations in sleep patterns were not of sufficient magnitude to result in significant degradation of performance capacity. Author

N77-33794*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
VISUAL LIGHT FLASH OBSERVATIONS ON SKYLAB 4 **c52**
Rudolf A. Hoffman, Lawrence S. Pinsky (Houston Univ.), W. Zach Osborne (Houston Univ.), and J. Vernon Bailey *In its* Biomed. Results from Skylab 1977 p 127-130 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

Evaluation of light flashes observed in earth orbit establishes: (1) a strong correlation of very high flash rates with passage through the South Atlantic anomaly; (2) evidence for a predicted latitude effect; and (3) an increased flash rate outside the anomaly during a second observation period. Event rates and flash descriptions during South Atlantic anomaly passes indicate that

there may be particles heavier than protons in the inner belt of trapped radiation. G.G.

N77-33795*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
CHANGES IN THE ACHILLES TENDON REFLEXES FOLLOWING SKYLAB MISSIONS **c52**
Joseph T. Baker (Technol., Inc., Houston), Arnauld E. Nicogossian, G. Wyckliffe Hoffler, Robert L. Johnson, and J. R. Hordinsky *In its* Biomed. Results from Skylab 1977 p 131-135 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

Postflight measurements of Achilles tendon reflex duration on Skylab crewmen indicate a state of disequilibrium between the flexor and extensor muscle groups with an initial decrease in reflex duration. As the muscles regain strength and mass there occurs an overcompensation reflected by increased reflex duration. Finally, when a normal neuromuscular state is reached the reflex duration returns to baseline value. G.G.

N77-33796*# Fordham Univ., New York.
TASK AND WORK PERFORMANCE ON SKYLAB MISSIONS 2, 3, AND 4: TIME AND MOTION STUDY: EXPERIMENT M151 **c54**
Joseph F. Kubis, Edward J. McLaughlin (Tex. Univ., Houston), Janice M. Jackson, Rudolph Rusnak, Gary H. McBride, and Susan V. Saxon *In* NASA. JSC Biomed. Results from Skylab 1977 p 136-154 ref (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 05H

Human task performance was evaluated under weightlessness conditions during long duration space flight in order to study the characteristics of the adaptation function. Results show that despite pronounced variability in training schedules and in initial reaction to the Skylab environment, in-flight task performance was relatively equivalent among Skylab crews, and behavioral performance continued to improve from beginning to end of all missions. G.G.

N77-33797*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
CREW EFFICIENCY ON FIRST EXPOSURE TO ZERO-GRAVITY **c52**
Owen K. Garriott and Gary L. Doerre *In its* Biomed Results from Skylab 1977 p 155-162 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06S

Activation task performance of Skylab crews showed improved efficiency as experience was gained in weightlessness living. During three activation intervals, less than 12 man-hours were lost due to reduced efficiency (including the effects of motion sensitivity) while almost 200 man-hours of productive work were delivered. Work rate improved for tasks in which simulation and training time were extensive and for tasks which allowed zero-gravity operations to be optimized. G.G.

N77-33798*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MINERAL AND NITROGEN METABOLIC STUDIES, EXPERIMENT M071 **c52**
G. Donald Whedon (Natl. Inst. of Health), Leo Lutwak (Calif. Univ., Los Angeles), Paul C. Rambaut, Michael W. Whittle, Malcolm C. Smith, Jr., Jeanne Reid (Natl. Inst. of Health), Carolyn S. Leach, Connie Rae Stadler (Technol., Inc., Houston), and Deanna D. Sanford (Technol., Inc., Houston) *In its* Biomed. Results from Skylab 1977 p 164-174 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

The similarity between bed rest test and space flight effects on human mineral and nitrogen metabolisms indicates impairment of capable musculoskeletal functions. A pattern of urinary calcium increases and total calcium shifts suggests that calcium losses continue with time. Significant losses of nitrogen and phosphorus are associated with reduction in muscle tissue. It is concluded that capable musculoskeletal function is likely to be impaired during space flights of 1 1/2 to 3 years duration. G.G.

N77-33799*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PHYSIOLOGICAL MASS MEASUREMENTS IN SKYLAB **c52**
William E. Thornton and John Ord (Dept. of the AF, Scott AFB, Ill.) *In its* Biomed. Results from Skylab 1977 p 175-182 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

A spring-mass oscillator constrained to linear motion was used to measure astronaut weight during Skylab mission. Plots of spacecrew body weights, preflight and postflight, and inflight equivalent weight measurements indicate high in-flight metabolic costs with weight losses under weightlessness conditions. G.G.

N77-33800*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
BONE MINERAL MEASUREMENT: EXPERIMENT M078 **c52**
Malcolm C. Smith, Jr., Paul C. Rambaut, John M. Vogel (Calif. Univ., Davis), and Michael W. Whittle *In its* Biomed. Results from Skylab 1977 p 183-190 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

Gamma ray absorptiometric measurements on bone mineral content, in addition to calcium balance studies, were performed on male volunteers during bed rest periods of 24 to 36 weeks duration and compared to Skylab mission data. Results show that mineral losses occur from the bones of the lower extremities during missions of up to 84 days and that in general they follow the loss patterns of the bed rest situation. The level of loss observed in Spacelab crews is not of clinical concern.G.G.

N77-33801*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MUSCULAR DECONDITIONING AND ITS PREVENTION IN SPACE FLIGHT **c52**
William E. Thornton and John A. Rummel *In its* Biomed. Results from Skylab 1977 p 191-197 ref (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

Exercise and exercise devices on Skylab missions prevented muscle loss in spacecrews. It is concluded that muscle in space is no different from muscle on earth; if it is properly nourished and exercised at reasonable load levels, it maintains its function under weightlessness conditions. G.G.

N77-33802*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
BIOSTEREOMETRIC ANALYSIS OF BODY FORM **c52**
Michael W. Whittle, Robin Herron (Tex. Inst. for Rehabil. and Res.), and Jaime Cuzzi *In its* Biomed. Results from Skylab 1977 p 198-202 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-00648-9 CSCL 06P

Four-camera stereophotogrammetry of Skylab crewmen, preflight and postflight, revealed a loss of volume of one to one and one-half liters from the legs, much of which was replaced during the first 4 postflight days. It is estimated that about one third of the loss represents partial atrophy due to relative disuse in zero-gravity, the remainder being due to a deficit in body fluid. Reduction in volume of the abdomen has also been noted. Author

N77-33803*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
BIOCHEMICAL RESPONSES OF THE SKYLAB CREWMEN: AN OVERVIEW **c52**
Carolyn S. Leach and Paul C. Rambaut *In its* Biomed. Results from Skylab. 1977 p 204-216 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-00648-9 CSCL 06P

Continuous metabolic and endocrinic monitoring of Skylab crewmen established significant biochemical changes that varied in magnitude and direction but disappeared shortly after return to earth. These changes indicate adaptation by the body to the combined stresses of weightlessness. Transient changes in fluid and electrolyte metabolisms lead to the conclusion that a homeostasis condition had been achieved. Unstable states persisted in the metabolisms of bone mineral, protein, and carbohydrates. G.G.

N77-33804*# Texas Univ., Galveston. Medical Branch.
CYTOGENETIC STUDIES OF BLOOD, EXPERIMENT M111 **c52**
Lillian H. Lockhart *In* NASA. JSC Biomed. Results from Skylab 1977 p 217-220 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

Analysis of the chromosome patterns of Skylab crewmen preflight and postflight recorded two types of defects: minor structural defects including chromatid breaks, chromosome breaks, deletions, and fragments were not significantly increased; structural rearrangements including dicentrics, exchange figures, inversions, and translocations occured more frequently. Data indicate that the flight itself in Skylab missions was not a contributing factor to these abberrations. G.G.

N77-33805*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE RESPONSE OF SINGLE HUMAN CELLS TO ZERO-GRAVITY **c52**
P. OB. Montgomery, Jr. (Dallas County Hosp. District), J. E. Cook (Dallas County Hosp. District), R. C. Reynolds (Tex. Univ., Dallas), J. S. Paul (Dallas County Hosp. District), L. Hayflick, D. Stock (Tex. Univ., Houston), W. W. Shulz (Dallas County Hosp. District), S. L. Kimzey, R. G. Thirolf, T. Rogers et al *In its* Biomed. Results from Skylab 1977 p 221-234 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06S

Microscopic and histochemical evaluations of human embrionic lung cells after exposure to zero-gravity are reported. Growth curves, DNA microspectrophotometry, phase microscopy, and ultrastructural studies of fixed cells revealed no effects on the cultures. Minor unexplained differences have been found in biochemical constituents of the samples. G.G.

N77-33806*# Baylor Univ., Houston, Tex. Coll. of Medicine.
BLOOD VOLUME CHANGES **c52**
Philip C. Johnson, Theda B. Driscoll, and Adrian D. LeBlanc *In* NASA. JSC Biomed. Results from Skylab 1977 p 235-241 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

Red cell mass measurements on Skylab crewmembers revealed a statistically significant decrease in circulating red cells. Low reticulocyte counts at crewmember recovery indicated increased splenic removal of reticulum or decreased bone marrow production rates. After the initial loss there is at least a 30-day delay before red cell mass begins to reconstitute itself. G.G.

N77-33807*# Missouri Univ., Columbia.
RED CELL METABOLISM STUDIES ON SKYLAB **c52**
Charles E. Mengel *In* NASA. JSC Biomed. Results from Skylab 1977 p 242-248 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

Blood samples from Spacelab crewmembers were studied for possible environment effects on red cell components. Analysis involved peroxidation of red cell lipids, enzymes of red cell metabolism, and levels of 2,3-diphosphoglyceric acid and adenosine triphosphate. Results show that there is no evidence of lipid peroxidation, that biochemical effect known to be associated with irreversible red cell damage. Changes observed in glycolytic intermediates and enzymes cannot be directly implicated as indicating evidence of red cell damage. G.G.

N77-33808*# National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Tex.
HEMATOLOGY AND IMMUNOLOGY STUDIES **c52**
Stephen L. Kimzey *In its* Biomed. Results from Skylab 1977 p 249-282 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06E

A coordinated series of experiments were conducted to evaluate immunologic and hemotologic system responses of Skylab crewmen to prolonged space flights. A reduced PHA responsiveness was observed on recovery, together with a reduced number of T-cells, with both values returning to normal 3 to 5 days postflight. Subnormal red cell count, hemoglobin concentration, and hematocrit values also returned gradually to preflight limits. Most pronounced changes were found in the shape of red blood cells during extended space missions with a rapid reversal of these changes upon reentry into a normal gravitational environment. G.G.

N77-33809*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LOWER BODY NEGATIVE PRESSURE: THIRD MANNED SKYLAB MISSION **c52**
Robert L. Johnson, G. Wykliffe Hoffler, Arnauld E. Nicogossian, Stuart A. Bergman, Jr., and Margaret M. Jackson *In its* Biomed. Results from Skylab 1977 p 284-312 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06S

The objective of the Skylab Lower Body Negative Pressure experiment was to determine the extent and the time course of changes in orthostatic tolerance during the weightlessness of space flight and to determine whether in-flight data from the experiment would be useful in predicting the postflight status of orthostatic tolerance. Compared to preflight results, lower body negative pressure produced exaggerated blood pressure and heart rate responses during the first in-flight test of the Skylab 2 crewmen and showed no clear-cut trend toward preflight levels during the 28-day flight. During the second manned mission, Skylab 3, similar exaggeration of blood pressure and heart rate responses occurred during the first in-flight test. Again no definite trend toward preflight values could be seen during the first 28 days but cardiovascular responses to lower body negative pressure appeared to become more stable by the sixth to eighth week of flight. In general, the test results in-flight served to predict quite well the orthostatic tolerance of the individual crewmen in the immediate postflight period. Author

N77-33810*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
VECTORCARDIOGRAPHIC RESULTS FROM SKYLAB MEDICAL EXPERIMENT M092: LOWER BODY NEGATIVE PRESSURE **c52**
G. Wylxliffe Hoffler, Robert L. Johnson, Arnauld E. Nicogossian, Stuart A. Bergman, Jr., and Margaret M. Jackson *In its* Biomed. Results from Skylab 1977 p 313-323 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

Electrocardiographic interval changes suggesting effects of increased vagal tone were observed early in some Gemini crewmembers. Preflight versus postflight amplitude differences appeared in electrocardiograms of several of the early Apollo crewmembers. In preflight and postflight crew evaluations of the last three Apollo flights, quantitative postflight vectorcardiographic changes were for the first time determined in American space crews. Changes not considered related to heart rate were mainly those of increased P and QRS vector magnitudes and orientation shifts. But since most of these postflight findings resembled those observed with the orthostatic stress of lower body negative pressure, it was inferred then that upon their return from space, these Apollo astronauts exhibited exaggerated responses to orthostasis in the vectorcardiogram as well as in measures of cardiovascular hemodynamics. Author

N77-33811*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
HEMODYNAMIC STUDIES OF THE LEGS UNDER WEIGHTLESSNESS **c52**

William E. Thornton and G. Wylkliffe Hoffler *In its* Biomed. Results from Skylab 1977 p 324-329 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06S

Significant among the medical findings following prolonged space flight are reduced orthostatic tolerance and ergometric work capacity. Changes in hemodynamics of the legs with increased blood pooling and reduction in cardiac output must be considered one of the most probable causes of these effects. Concern for the above plus the observed marked tissue changes occurring in the legs during flight prompted the addition of several procedures to evaluate hemodynamic changes in the leg; resting arterial blood flow, venous compliance and muscle pumping were investigated. In so far as possible, the initial reaction to pressure in the smallest possible vein segment was examined.
Author

N77-33812*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ANTHROPOMETRIC CHANGES AND FLUID SHIFTS c52
William E. Thorton, G. Wyckliffe Hoffler, and John A. Rummel *In its* Biomed. Results from Skylab 1977 p 330-338 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06S

In an effort to obtain the most comprehensive and coherent picture of changes under weightlessness, a set of measurements on Skylab 2 was initiated and at every opportunity, additional studies were added. All pertinent information from ancillary sources were gleaned and collated. On Skylab 2, the initial anthropometric studies were scheduled in conjunction with muscle study. A single set of facial photographs was made in-flight. Additional measurements were made on Skylab 3, with photographs and truncal and limb girth measurements in-flight. Prior to Skylab 4, it was felt there was considerable evidence for large and rapid fluid shifts, so a series of in-flight volume and center of mass measurements and infrared photographs were scheduled to be conducted in the Skylab 4 mission. A number of changes were properly documented for the first time, most important of which were the fluid shifts. The following description of Skylab anthropometrics address work done on Skylab 4 primarily.
Author

N77-33813*# Vanderbilt Univ., Nashville, Tenn.
VECTORCARDIOGRAPHIC CHANGES DURING EXTENDED SPACE FLIGHT (M093): OBSERVATIONS AT REST AND DURING EXERCISE c52
Raphael F. Smith, Kevin Stanton (Naval Aerospace Med. Inst., Pensacola, Fla.), David Stoop (Naval Aerospace Med. Inst., Pensacola, Fla.), Donald Brown (Naval Aerospace Med. Inst., Pensacola, Fla.), Walter Janusz, and Paul King *In* NASA. JSC Biomed. Results from Skylab 1977 p 339-350 refs (For primary document see N77-33780 24-51)
Avail: NTIS HC A02/MF A01 CSCL 06S

The objectives of Skylab Experiment M093 were to measure electrocardiographic signals during space flight, to elucidate the electrophysiological basis for the changes observed, and to assess the effect of the change on the human cardiovascular system. Vectorcardiographic methods were used to quantitate changes, standardize data collection, and to facilitate reduction and statistical analysis of data. Since the Skylab missions provided a unique opportunity to study the effects of prolonged weightlessness on human subjects, an effort was made to construct a data base that contained measurements taken with precision and in adequate number to enable conclusions to be made with a high degree of confidence. Standardized exercise loads were incorporated into the experiment protocol to increase the sensitivity of the electrocardiogram for effects of deconditioning and to detect susceptability for arrhythmias.
Author

N77-33814# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EVALUATION OF THE ELECTROMECHANICAL PROPERTIES OF THE CARDIOVASCULAR SYSTEM AFTER PROLONGED WEIGHTLESSNESS c52
Stuart A. Bergman, Jr., Robert L. Johnson, and G. Wyckliffe Hoffler *In its* Biomed. Results from Skylab 1977 p 351-365 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

Devices and techniques for measuring and analyzing systolic time intervals and quantitative phonocardiograms were initiated during Apollo 17. The data show that the systolic time interval from Apollo 17 crewmen remained elevated longer postflight than the response criteria of heart rate, blood pressure, and percent change in leg volume all of which had returned to preflight levels by the second day postflight. Although the systolic time interval values were only slightly outside the preflight fiducial limits, this finding suggested that: the analysis of systolic time intervals may help to identify the mechanisms of postflight orthostatic intolerance by virtue of measuring ventricular function more directly and the noninvasive technique may prove useful in determining the extent and duration of cardiovascular instability after long duration space flight. The systolic time intervals obtained on the Apollo 17 crewmen during lower body negative pressure were similar to those noted in patients with significant heart disease.
Author

N77-33815*# National Institutes of Health, Bethesda, Md.
EFFECT OF PROLONGED SPACE FLIGHT ON CARDIAC FUNCTION AND DIMENSIONS c52
Walter L. Henry, Stephen E. Epstein, James M. Griffith, Robert E. Goldstein, and David R. Redwood *In* NASA., JSC Biomed. Results from Skylab 1977 p 366-371 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06S

By taking advantage of the capabilities of echocardiography to measure noninvasively left ventricular volume, stroke volume, and ejection fraction, and of the fact that the astronauts were routinely subjected to lower body negative pressure (whereby cardiac filling is progressively decreased), it was possible to construct classic ventricular function curves noninvasively, thereby obviating the difficulties encountered in comparing cardiac function at different end-diastolic volumes preflight and postflight. In this manner, the effect of an 84-day period of weightlessness on cardiac structure and function was evaluated in the Skylab 4 astronauts.
Author

N77-33816*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
RESULTS OF SKYLAB MEDICAL EXPERIMENT M171-METABOLIC ACTIVITY c52
Edward L. Michel, John A. Rummel, Charles F. Sawin, Melvin C. Buderer (Life Sciences Div. Technol. Inc., Houston, Tex.), and John D. Lem *In its* Biomed. Results from Skylab 1977 p 372-387 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 003-000-00648-9 CSCL 06P

The primary objective of the experiment was to determine whether man's metabolic effectiveness while performing mechanical work was progressively altered by exposure to the space environment. The secondary objective was to evaluate the M171 bicycle ergometer as an in-flight crew personal exerciser. This manuscript is the report of the third (Skylab 4) manned mission and a summary of what was learned from all three Skylab manned missions about the physiological response to exercise during and after periods of 28 days, 59 days, and 84 days of weightlessness, respectively.
Author

N77-33817*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PULMONARY FUNCTION EVALUATION DURING AND FOLLOWING SKYLAB SPACE FLIGHTS c52
Charles F. Sawin, Arnauld E. Nicogossian, A. Paul Schachter (Technol. Inc., Houston, Tex.), John A. Rummel, and Edward L. Michel *In its* Biomed. Results from Skylab 1977 p 388-394 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 003-000-00648-9 CSCL 06P

Cardiac output measurements were made in the laboratory during preflight and postflight exercise tests. Due to the magnitude of decreases in cardiac output following the first and second manned Skylab missions and because the method used is based

upon normal pulmonary function, it was decided to perform more thorough pulmonary function screening in conjunction with the final and longest duration Skylab mission. This paper summarized pulmonary function data obtained during all three Skylab missions. Author

N77-33818*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
METABOLIC COST OF EXTRAVEHICULAR ACTIVITIES **c52**
James M. Waligora and David J. Horrigan, Jr. *In its* Biomed. Results from Skylab 1977 p 395-399 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

The Skylab zero-g extravehicular activity data is of particular interest when it is considered in combination with the Apollo and Gemini data. The energy cost of extravehicular activity from Gemini through Skylab is discussed. Author

N77-33819*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DETERMINATION OF CARDIAC SIZE FROM CHEST ROENTGENOGRAMS FOLLOWING SKYLAB MISSIONS **c52**
Arnauld E. Nicogossian, G. Wyckliffe Hoffler, Robert L. Johnson (USAF Academy, Colorado Springs, Colo.), and Richard J. Gowen *In its* Biomed. Results from Skylab 1977 p 400-405 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

The majority of crewmembers who exhibited postflight decreases in the cardiac silhouette size also showed a decreased orthostatic tolerance to lower body negative pressure. Similar findings were also reported by the Soviet investigators following 30-day bedrest studies and in cosmonauts upon return from space missions. Further radiological data from all three Skylab manned missions are presented and the physiological factors possibly involved in the cardiac silhouette changes are discussed. Author

N77-33820*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB: A BEGINNING **c12**
Lawrence F. Dietlein *In its* Biomed. Results from Skylab 1977 p 408-418 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 22A

A major goal of Skylab was to learn more about man and his responses to the space environment for missions lasting up to 84 days. A review of Skylab data pertaining to this goal is given. Author

N77-33821*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LOWER BODY NEGATIVE PRESSURE DEVICE **c52**
Robert W. Nolte *In its* Biomed. Results from Skylab 1977 p 421-423 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

The Lower Body Negative Pressure Device was used, in the space environment, to stress the astronaut's cardiovascular system, to determine the extent and time course of his cardiovascular deconditioning and to determine whether in-flight data from experiment M092, Lower Body Negative Pressure, would be useful in predicting postflight status of orthostatic tolerance. The lower portion of the subject's body was enclosed in this device for the purpose of applying regulated and controlled negative pressure. A description is given of the device. Author

N77-33822*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
AUTOMATIC BLOOD PRESSURE MEASURING SYSTEM (M091)
Robert W. Nolte *In its* Biomed. Results from Skylab 1977 p 424-427 refs
(For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

The Leg Volume Measuring System is used to measure leg calf girth changes that occur during exposure to lower body negative pressure as a result of pooling of blood and other fluids in the lower extremities. Author

N77-33823*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
AUTOMATIC BLOOD PRESSURE MEASURING SYSTEM (M092) **c52**
Robert W. Nolte *In its* Biomed. Results from Skylab 1977 p 428-432 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

The Blood Pressure Measuring System is described. It measures blood pressure by the noninvasive Korotkoff sound technique on a continual basis as physical stress is imposed during experiment M092, Lower Body Negative Pressure, and experiment M171, Metabolic Activity. Author

N77-33824*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
VECTORCARDIOGRAPH **c52**
John Lintott and Martin J. Costello (Martin Marietta Aerospace, Denver, Colo.) *In its* Biomed. Results from Skylab 1977 p 441-444 ref (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

A system for quantitating the cardiac electrical activity of Skylab crewmen was required for three medical experiments (M092, Lower Body Negative Pressure; M171, Metabolic Activity; and M093, In-flight Vectorcardiogram) designed to evaluate the effects of space flight on the human cardiovascular system. A Frank lead vectorcardiograph system was chosen for this task because of its general acceptability in the scientific community and its data quantification capabilities. To be used effectively in space flight, however, the system had to meet certain other requirements. The system was required to meet the specifications recommended by the American Heart Association. The vectorcardiograph had to withstand the extreme conditions of the space environment. The system had to provide features that permitted ease of use in the orbital environment. The vectorcardiograph system performed its intended function throughout all the Skylab missions without a failure. A description of this system follows. Author

N77-33825*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
A.I.e. IN-FLIGHT BLOOD COLLECTION SYSTEM **c52**
John M. Hank *In its* Biomed. Results from Skylab 1977 p 433-435 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

The hardware selected to obtain and partially process human blood samples during the Skylab missions is described and consists of the following three major items: a centrifuge, an evacuation regulator, and a Beta cloth bag. Author

N77-33826*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ERGOMETER **c52**
John D. Lam *In its* Biomed. Results from Skylab 1977 p 436-440 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

The bicycle ergometer was designed for use in experiments M171 and M093 and for use in optional exercise by the crewmen. The ergometer allows a crewman to exercise in zero-gravity using either his hands or his feet. It provides a precisely calibrated and, if needed, a programmable standard of work rate for the crewman. The ergometer operates in any of three selectable modes. The set heart rate mode varies the ergometer work rate, as necessary, to achieve and maintain a preselected heart rate. The sequenced heart rate mode is similar to the set heart rate mode except that the heart rate is programmable through five preset levels with a period of time for each level. The set work rate mode delivers a preset work load to the subject. Author

N77-33827*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
METABOLIC ANALYZER **c52**
John D. Lem *In its* Biomed. Results from Skylab 1977 p 445-447 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

The metabolic analyzer was designed to support experiment M171. It operates on the so-called open circuit method to measure a subject's metabolic activity in terms of oxygen consumed, carbon dioxide produced, minute volume, respiratory exchange ratio, and tidal volume or vital capacity. The system operates in either of two modes. (1) In Mode I, inhaled respiratory volumes are actually measured by a piston spirometer. (2) In Mode II, inhaled volumes are calculated from the exhaled volume and the measured inhaled and exhaled nitrogen concentrations. This second mode was the prime mode for Skylab. Following is a brief description of the various subsystems and their operation. Author

N77-33828*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
BODY TEMPERATURE MEASURING SYSTEM (M171) **c52**
John D. Lem *In its* Biomed. Results from Skylab 1977 p 448-449 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

The body temperature probe is used in support of experiment M171 to determine if crewmen are storing heat following exercise and to monitor crew health in case of illness. Author

N77-33829*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
HARDWARE REPORT FOR EXPERIMENT M133, SLEEP MONITORING ON SKYLAB **c52**
Cletis R. Booher and E. Fontaine LaRue (Martin Marietta Aerospace, Denver) *In its* Biomed. Results from Skylab 1977 p 450-454 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

The purpose of the experiment was objectively to measure sleep quantity and quality during prolonged space flight with the use of automatic equipment for onboard analyses of electroencephalographic (EEG) and electro-oculographic (EOG) activity and telemetry of sleep stage data. Author

N77-33830*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB EXPERIMENT M131: ROTATING LITTLE CHAIR **c52**
James S. Evans, Dennis L. Zitterkopf (Johns Hopkins Univ., Silver Spring, Md.), Robert L. Konigsberg (Johns Hopkins Univ., Silver Spring, Md.), and Chalres M. Blackburn (Johns Hopkins Univ., Silver Spring, Md.) *In its* Biomed. Results from Skylab 1977 p 455-458 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

Physiological considerations suggest that the response of the vestibular system can be substantially modified during weightlessness and that such modifications affect susceptibility to motion sickness and to judgment of spatial localization. Evaluation of such effects requires measurement of responses to rotational accelerations before, during, and after exposure to conditions of prolonged zero-gravity. For this purpose, a precisely controlled rotating chair was designed, constructed, tested, and installed in the Skylab Orbital Workshop. The chair was used in three test modes to measure changes in the vestibular (balance) organs of the astronauts. Author

N77-33831*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXPERIMENT SUPPORT SYSTEM **c52**
Albert V. Shannon *In its* Biomed. Results from Skylab 1977 p 459-462 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

The Experiment Support System is a switchboard system with displays and controls. It routes electrical power to experiments M092, M093, and M171 equipment; gaseous nitrogen to the Blood Pressure Measurement System; receives biomedical data from all related equipment; routes the conditioned data signals to the Airlock Module Telemetry System and also displays (in digital or analog from) portions of that data which the crewmen must see to complete the experiment successfully. The Experiment Support System is interfaced to the M131 control panel to transfer conditioned data to the Airlock Module Telemetry System. Author

N77-33832*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
IN-FLIGHT MEDICAL SUPPORT SYSTEM **c52**
Charles Chassay and Sylvia A. Rose (Boeing Co., Houston) *In its* Biomed. Results from Skylab 1977 p 463-473 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

The In-flight Medical Support System for Skylab was designed to provide the onboard Crew Physician or Scientist Pilot (or other crewmember if the Scientist Pilot was unable to act) with information adequate to make diagnostic assessment of those injuries or illnesses most likely to occur in the Skylab environment. The necessary diagnostic, therapeutic, and laboratory equipment needed to diagnose and to render first aid, resuscitative or supportive measures was stored in the Skylab Orbital Workshop. The resupply kit containing refrigerated laboratory and drug resupply items was stored in the Command Module. Author

N77-33833*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
CARBON DIOXIDE/DEWPOINT MONITOR **c52**
Stanley Luczkowski *In its* Biomed. Results from Skylab 1977 p 474-477 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

The portable Carbon Dioxide/Dewpoint Monitor was designed to permit measurements of carbon dioxide partial pressure and dewpoint and ambient gas temperature at any place within the Saturn Workshop. It required no vehicle interface other than storage. All components necessary for operation, including battery power source, were incorporated in the instrument. Author

N77-33834*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ATMOSPHERIC ANALYZER, CARBON MONOXIDE MONITOR AND TOLUENE DIISOCYANATE MONITOR **c52**
Albert V. Shannon *In its* Biomed. Results from Skylab 1977 p 478-480 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

The purpose of the atmospheric analyzer and the carbon monoxide and toluene diisocyanate monitors is to analyze the atmospheric volatiles and to monitor carbon monoxide and toluene diisocyanate levels in the cabin atmosphere of Skylab. The carbon monoxide monitor was used on Skylab 2, 3, and 4 to detect any carbon monoxide levels above 25 ppm. Air samples were taken once each week. The toluene diisocyanate monitor was used only on Skylab 2. The loss of a micrometeoroid shield following the launch of Skylab 1 resulted in overheating of the interior walls of the Orbital Workshop. A potential hazard existed from outgassing of an isocyanate derivative resulting from heat-decomposition of the rigid polyurethane wall insulation. The toluene diisocyanate monitor was used to detect any polymer decomposition. The atmospheric analyzer was used on Skylab 4 because of a suspected leak in the Skylab cabin. An air sample was taken at the beginning, middle, and the end of the mission. Author

N77-33835*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB HARDWARE REPORT OPERATIONAL BIOINSTRUMENTATION SYSTEM **c52**
Stanley Luczkowski *In its* Biomed. Results from Skylab 1977 p 481-484 ref (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

The Skylab Operational Bioinstrumentation System is a personal, individually adjustable biomedical system designed to

monitor the basic physiological functions of each suited crewman during specified periods of a manned space mission. The basic physiological functions of this system include electrocardiogram, respiration by impedance pneumogram, body temperature, cardiotachometer, and subject identification. The Operational Bioinstrumentation System was scheduled to monitor each crewman during launch, extravehicular activities, suited intravehicular experiments, and undocking and return. Author

N77-33836*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXERCISER **c52**
John D. Lem *In its* Biomed. Results from Skylab 1977 p 485-486 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

The Mark I exerciser which was added for the second and third Skylab missions, was used for a number of arm and leg exercises. This unit is a modified version of a commercial device. This is an iso-kinetic, or constant velocity, exerciser which retards the speed at which the user is allowed to move. The user applies a maximum effort and the device automatically varies the opposing resistance to maintain speed of translation at a constant preselected value. Author

N77-33837*# Battelle Pacific Northwest Labs., Richland, Wash. Occupational and Environmental Safety Dept.
INVESTIGATE METHODS FOR MEASURING MUSCLE AND BONE MASS CHANGES IN ASTRONAUTS AND ANIMALS WHICH OCCUR DURING SPACE FLIGHT Final Report, 1 Dec. 1976 - 31 Aug. 1977
H. E. Palmer 31 Aug. 1977 23 p refs
(Contract NAS9-14248)
(NASA-CR-151518) Avail: NTIS HC A02/MF A01 CSCL 06B

Sodium-22 is being used as a tracer for bone mineral metabolism studies. Dogs are being grown from puppies to adulthood on a diet containing a constant level of sodium-22 in order to uniformly tag the entire skeleton with a long lived radionuclide. This study is still in progress and the dogs are still growing. Potassium-40 measurements were made on people, who are replacing muscle mass lost due to leg injuries, in a second study. It appears that potassium-40 measurements provide an accurate and convenient method for determining relative changes in the muscle content of the leg. Author

N77-33838*# General Electric Co., Houston, Tex. Apollo Systems Dept.
SPACE SHUTTLE LIFE SCIENCES REQUIREMENTS DEVELOPMENT AND DOCUMENTATION Final Report
P. C. VanNordstrand 26 Sep. 1977 11 p
(Contract NAS9-14973)
(NASA-CR-151529; TIR-782-LSP-7014) Avail: NTIS HC A02/MF A01 CSCL 06B

Planning requirements identified in this study cover a range of functions including management plans, payload planning, optimization and analysis, flight and mission planning, and mission reporting, as well as all the design, integration and test functions that are hardware oriented. Some of the above functions would be done only once for the entire program, others would be done once for each payload, and others are applicable to each of the many experiments or end items in each payload. Author

N77-33839*# Hawaii Univ., Honolulu.
STUDY OF METABOLISM AND ENERGETICS IN HYPOGRAVITY: DEGENERATIVE EFFECTS OF PROLONGED HYPOGRAVITY Final Report, 1 Sep. 1971 - 1 Apr. 1976
Sanford M. Siegel 1 Nov. 1976 67 p refs
(Contract NAS2-8687)
(NASA-CR-155199) Avail: NTIS HC A04/MF A01 CSCL 06C

The role of gravity in the formation of rigid, lignified plant cell walls, hence to the development of the erect land plant body, is examined. An experiment was proposed with a general hypothesis that a chosen plant, a dwarf marigold, would display degenerative changes in mechanical supportive systems under hypogravity because normal lignin-cellulose wall structure fails to develop. Observational and experimental results are given. G.D.H.

N77-33840*# California Univ., Davis.
HIGHER PLANT METABOLISM AND ENERGETICS IN HYPOGRAVITY: AMINO ACID METABOLISM IN HIGHER PLANTS Final Report
Mendel Mazelis 31 Oct. 1976 40 p refs
(Contract NAS2-8685)
(NASA-CR-155198) Avail: NTIS HC A03/MF A01 CSCL 06C

Laboratory's investigation into the amino acid metabolism of dwarf marigolds exposed to an environment of simulated hypogravity is summarized. Using both in vivo, and/or in vitro studies, the following effects of hypogravitational stress have been shown: (1) increased proline incorporation into cell wall protein, (2) inhibition of amino acid decarboxylation, (3) decrease in glutamic acid decarboxylase activity; and (4) decrease in the relative amount of a number of soluble amino acids present in deproteinized extracts of marigold leaves. It is concluded from these data there are several rapid, major alterations in amino acid metabolism associated with hypogravitational stress in marigolds. The mechanism(s) and generality of these effects with regard to other species are still unknown. Author

N77-33841# Joint Publications Research Service, Arlington, Va.
TRANSLATION ON USSR SCIENCE AND TECHNOLOGY BIOMEDICAL SCIENCES, NO. 9
3 Oct. 1977 77 p Transl. into ENGLISH from Selected Foreign Periodicals (USSR)
(JPRS-69899) Avail: NTIS HC A05/MF A01

Information on aerospace medicine, agrotechnology, bionics and bioacoustics, biochemistry, biophysics, environmental and ecological problems, food technology, and microbiology is reported. Investigations in epidemiology and immunology, marine biology, military medicine, physiology, public health and toxicology are also included. Scientists and scientific organizations in biomedical fields are cited along with studies in radiobiology, veterinary medicine, behavioral science, human engineering, psychology and psychiatry. Author

N77-33842# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY BIOMEDICAL SCIENCES, NO. 10
6 Oct. 1977 57 p Transl. into ENGLISH from Selected Foreign Periodicals (USSR)
(JPRS-69924) Avail: NTIS HC A04/MF A01
For abstract, see N77-33841.

N77-33843# Joint Publications Research Service, Arlington, Va.
SPACE BIOLOGY AND AEROSPACE MEDICINE, NO. 4, 1977
14 Oct. 1977 97 p Transl. into ENGLISH from Selected Foreign Periodicals (USSR)
(JPRS-69964) Avail: NTIS HC A05/MF A01

Articles are presented concerning: (1) the selection and training of cosmonauts; (2) evaluation and analysis of accumulated data to facilitate the on-going transition from orbital to interplanetary flight; (3) research aimed at guaranteeing safety on long flights and reliability of the human component of the man-spaceship system; (4) space psychology and physiology; (5) environmental problems and control; and (6) telemetry. Author

N77-33844# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY BIOMEDICAL SCIENCES, NO. 12

25 Oct. 1977 52 p Transl. into ENGLISH from Selected Foreign Periodicals (USSR)
(JPRS-70017) Avail: NTIS HC A04/MF A01

Selected papers on neurosurgery and public health are presented. Health indexes for construction workers, noise vibration standards, and vibration sensitivity are discussed along with industrial safety factors. J.M.S.

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N77-33845*# Scientific Translation Service, Santa Barbara, Calif.
RETENTION OF SELECTED PHYSIOLOGICAL INDICATORS IN PILOTS IN THE COURSE OF AGRICULTURAL FLIGHTS
Lech Markiewicz, Danuta Koradecka, and Maria Konarska Washington NASA Aug. 1977 14 p Transl. into ENGLISH of Polish conf. paper Presented at Ergonomics in Aviat: 1st Natl. Sci. Technol. Conf., Warsaw, 17-19 Mar. 1975 p 41-52 Original language document was announced as A76-28530
(Contract NASw-2791)
(NASA-TT-F-17441) Avail: NTIS HC A02/MF A01 CSCL 06S

Stress on the organism of pilots maneuvering fixed-wing or rotary-wing aircraft in crop-dusting and sowing operations, with abrupt changes in terrain and sharp turns required, is studied on the basis of telemetered heart rate, tremorgrams, indications of muscle fatigue (particularly, flexor muscles of the fingers), and response to vibrations. Comparisons are made of data for low-level flight over even terrain and nap-of-the-earth flight over hilly terrain. Responses in fixed-wing flight and helicopter flight are also contrasted. Criteria are proposed for optimization of piloting conditions in this type of service. Restrictions on interpretation of the data are stated, and data are presented in tabular and graphic form. Author

N77-33846*# Scientific Translation Service, Santa Barbara, Calif.
ACTIVITY OF THE DIGESTIVE SYSTEM DURING 49-DAY ANTIORTHOSTATIC HUMAN HYPOKINESIA
K. V. Smirnov and L. G. Goland Oct. 1977 16 p refs Transl. into ENGLISH from Fiziol. Cheloveka (USSR), v. 2, Jul. - Aug. 1976 p 653-660 Original language document was announced as A77-14179
(Contract NASw-2791)
(NASA-TM-75177) Avail: NTIS CSCL 06S

It is proposed that the obtained changes in the functional condition of the digestive system during experimental hypokinesia be studied since it is of practical importance for clinical medicine in cases where a patient remains confined to bed for a lengthy period. Antiorthostatic hypokinesia for 49 days was found to have a significant effect on the functions of the organs in the gastorintestinal tract. These effects included: an increase in stimulated juice secretion and acid formation; phase changes in the activity of the digestive enzymes; depression of the gastric motor function; and intensification of bile formation. Author

N77-33847*# San Jose State Univ., Calif. Dept. of Psychology.
VESTIBULAR-VISUAL INTERACTIONS IN FLIGHT SIMULATORS Final Report, 1 Sep. 1967 - 30 Sep. 1977
Brant Clark Sep. 1977 30 p refs
(Grant NGL-05-046-002)
(NASA-CR-155200) Avail: NTIS HC A03/MF A01 CSCL 05E

All 139 research papers published under this ten-year program are listed. Experimental work was carried out at the Ames Research Center involving man's sensitivity to rotational acceleration, and psychophysical functioning of the semicircular canals; vestibular-visual interactions and effects of other sensory systems were studied in flight simulator environments. Experiments also dealt with the neurophysiological vestibular functions of animals, and flight management investigations of man-vehicle interactions. J.L.H.

N77-33848# Kentucky Univ., Lexington. Wenner-Green Research Lab.
RESPONSE OF THE CARDIOVASCULAR SYSTEM TO VIBRATION AND COMBINED STRESSES Interim Scientific Report, 1 Sep. 1975 - 30 Sep. 1976
Charles F. Knapp 30 Sep. 1976 50 p refs
(Contract F44620-74-C-0012)
(AD-A039000; AFOSR-77-0518TR) Avail: NTIS HC A03/MF A01 CSCL 06/19

Low frequency, sinusoidal accelerations were used to quantify the frequency response of cardiovascular regulation in awake, chronically instrumented canines using pharmacologic blocking agents to delineate the relative contributions of cardiac and peripheral vascular mechanisms required to maintain circulatory integrity during time-dependent acceleration loadings. Cyclic heart rate changes observed in the unblocked animals were almost always the same as those of the sinusoidal acceleration for frequencies up to 0.3 Hz. Preliminary results using pharmacologic blockage indicate that the open loop response of aortic pressure is maximal between 0.04 and 0.06 Hz and that the influence of peripheral mechanisms is evident up to 0.03 Hz. GRA

N77-33849# California Univ., Los Angeles. Lab of Environmental Neurobiology.
NEUROPHYSIOLOGICAL ESTIMATES OF HUMAN PERFORMANCE CAPABILITIES IN AEROSPACE SYSTEMS Final Scientific Report, 1 Oct. 1974 - 30 Sep. 1976
W. R. Adey 30 Nov. 1976 155 p refs
(Contract F44620-75-C-0030)
(AD-A038206; AFOSR-77-0362TR) Avail: NTIS HC A08/MF A01 CSCL 06/19

The objective of this work was the determination of physiological estimators of stress during task performance, recognition of physiological status in operators of weapon systems and the understanding of the mechanisms relating to stresses encountered under operational conditions. The data cover a wide range of human performance measures and the physiological mechanisms which underlie these measures. The studies included levels of performance after sleep interruptions, human operator performance capability following varying periods of exposure to a range of angles of a simulated cockpit seat, effects of weak environmental electromagnetic fields on calcium ion binding in cerebral tissue, development of a biomedical monitoring system with capability for command transmission over limited bandwidths channels, evaluation of operational potential of remote medical monitoring by cryomagnetometry, and other techniques for no-contact monitoring and biomedical sensing in performing subjects. GRA

N77-33850# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
BIBLIOGRAPHY OF RESEARCH REPORTS AND PUBLICATIONS: IMPACT, VIBRATION, WINDBLAST AND ESCAPE, 1942 - 1976
Richard J. Zember and Joan Lanby Robinette Jul. 1977 50 p
(AF Proj. 7231)
(AD-A042201; AMRL-TR-76-120) Avail: NTIS HC A03/MF A01 CSCL 06/19

This bibliography lists technical reports in the areas of impact, vibration, windblast, and escape published from 1942 to 1976 by the Aerospace Medical Research Laboratory. Five appendices include titles of reports in the areas of impact, windblast and escape published from 1942 to 1958 by Aeromedical Research Laboratory, Holloman AFB, New Mexico, and USAF School of Aerospace Medicine, Brooks AFB, Texas. Author (GRA)

N77-33851# Los Alamos Scientific Lab., N. Mex.
AUTOMATED CHEST X-RAY ANALYSIS
E. L. Hall (Univ. of Southern Calif., Los Angeles), B. K. Rouge (Univ. of Southern Calif., Los Angeles), and R. P. Kruger 1977 10 p refs Presented at 20th Ann. SPIE Tech. Symp., San Diego, Calif., 23 Aug. 1976
(Contracts W-7405-eng-36; HSM-99-73-92)
(LA-UR-77-532) Avail: NTIS HC A02/MF A01

A computer hardware-software system was developed for extracting optical and digital measurements from chest X-rays and using these measurements to classify the severity of lung disease. The system consists of a digital image scanner and an

optical system consisting of an x-y controller for film transportation and an RSI Fraunholfer diffraction pattern sampling unit. Initially the classification was of opacity textural patterns associated with coal workers pneumoconiosis (CWP), however, the system appears to be expandable to all diseases described in the international standard with only software modification. Extensions to large opacity detection, measures of ling vascularity and lung and heart volume were made. Results indicate classification accuracy rates for pneumoconioses comparable to visual readings of the films by expert radiologists, and significantly better than non-radiologist physicians who often read these films. ERA

N77-33852# Royal Norwegian Council for Scientific and Industrial Research, Trondheim. Akustisk Lab.
NOISE INDUCED HEARING LOSS. NOISE EVALUATION. THE USE OF HEARING PROTECTORS
Gordon Flottorp and Sverre Quist-Hansen 1975 21 p refs In NORWEGIAN; ENGLISH summary
(NTNF-4) Avail: NTIS HC A02/MF A01; Roy. Norweg. Council for Sci. and Ind. Res., Trondheim Nor. Kr. 30

Some of the arguments behind the criteria for noise induced hearing loss, presented by health inspectors in Norway, are discussed. Noise limits specified by these criteria are often found to be exceeded. ESA

N77-33853# Bureau of Radiological Health, Rockville, Md. WHO Collaborating Center for Standardization of Protection Against Nonionizing Radiations.
BIOLOGICAL EFFECTS OF ELECTROMAGNETIC WAVES. SELECTED PAPERS OF THE USNC/URSI ANNUAL MEETING, VOLUME 2 Annual Report
C. Johnson, ed. (Utah Univ.) and M. Shore, ed. Apr. 1977 478 p refs Meeting held at Boulder, Colo., 20-23 Oct. 1975; sponsored in part by International Union of Radio Science, Washington, D.C., US National Committee
(PB-268095/7; DHEW/PUB/FDA-77/8011; FDA/BRH-77/98) Avail: NTIS HC A21/MF A01 CSCL 06R

Subjects reported include: (1) high voltage electric field coupling to humans using moment method techniques; (2) measurement of radiofrequency power absorption in monkeys, monkey phantoms, and human phantoms exposed to 10-50 MHz fields; (3) theoretical calculations of power absorbed by monkey and human prolate spheroidal phantoms in an irradiation chamber; (4) interaction of microwave frequency and polarization with animal size; (5) the biological significance of radiofrequency radiation emission on cardiac pacemaker performance; (6) methods and instrumentation for the evaluation and calibration of microwave survey instruments; (7) a new system for investigating nonthermal effect of microwaves on cells; (8) mapping of free space and scattered fields in microwave diathermy; (9) a two impedance method for wide range dielectrometry. GRA

N77-33781*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB MEDICAL PROGRAM OVERVIEW
Richard S. Johnson *In its* Biomed. Results from Skylab 1977 p 3-19 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

N77-33783*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB 4 CREW OBSERVATIONS
Edward G. Gibson *In its* Biomed. Results from Skylab 1977 p 22-26 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

N77-33784*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB 2 CREW OBSERVATIONS AND SUMMARY
Joseph P. Kerwin *In its* Biomed. Results from Skylab 1977 p 27-29 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06S

N77-33785*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB CREW HEALTH: CREW SURGEON'S REPORT
Jerry R. Hordinsky *In its* Biomed. Results from Skylab 1977 p 30-34 ref (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

N77-33786*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB ORAL HEALTH STUDIES
Lee R. Brown (Tex. Univ., Houston), William J. Frome, Sandra Handler (Tex. Univ., Houston), Merrill G. Wheatcroft (Tex. Univ., Houston), and Linda J. Rider (Tex. Univ., Houston) *In its* Biomed. Results from Skylab 1977 p 35-44 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06E

N77-33787*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ANALYSIS OF THE SKYLAB FLIGHT CREW HEALTH STABILIZATION PROGRAM
J. Kelton Ferguson, Gary W. McCollum (Public Health Service, Atlanta), and Benjamin L. Portnoy *In its* Biomed. Results from Skylab 1977 p 45-52 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06E

N77-33789*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
RADIOLOGICAL PROTECTION AND MEDICAL DOSIMETRY FOR THE SKYLAB CREWMEN
J. Vernon Bailey, Rudolf A. Hoffman, and Robert A. English *In its* Biomed. Results from Skylab 1977 p 64-69 refs (For primary document see N77-33780 24-51)
Avail: NTIS CSCL 06R

N77-33790*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
TOXICOLOGICAL ASPECTS OF THE SKYLAB PROGRAM
Wayland J. Rippstein, Jr. and Howard J. Schneider *In its* Biomed. Results from Skylab 1977 p 70-72 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06T

N77-33791*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXPERIMENT M131. HUMAN VESTIBULAR FUNCTION
Ashton Graybiel (Naval Aerospace Med. Res. Lab., Pensacola, Fla.), Earl F. Miller, II (Naval Aerospace Med. Res. Lab., Pensacola, Fla.), and Jerry L. Homick *In its* Biomed. Results from Skylab 1977 p 74-103 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

N77-33792*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE EFFECTS OF PROLONGED EXPOSURE TO WEIGHTLESSNESS ON POSTURAL EQUILIBRIUM
Jerry L. Homick, Millard F. Reschke, and Earl F. Miller, II *In its* Biomed. Results from Skylab 1977 p 104-112 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06S

N77-33793*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXPERIMENT M133. SLEEP MONITORING ON SKYLAB
James D. Frost, Jr. (Baylor Coll. of Med.), William H. Schumate, Joseph G. Salamy (Technol., Inc., Houston), and Cletis R. Booher *In its* Biomed. Results from Skylab 1977 p 113-126 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

N77-33794*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
VISUAL LIGHT FLASH OBSERVATIONS ON SKYLAB 4
Rudolf A. Hoffman, Lawrence S. Pinsky (Houston Univ.), W. Zach Osborne (Houston Univ.), and J. Vernon Bailey *In its* Biomed. Results from Skylab 1977 p 127-130 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

N77-33795*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
CHANGES IN THE ACHILLES TENDON REFLEXES FOLLOWING SKYLAB MISSIONS
Joseph T. Baker (Technol., Inc., Houston), Arnauld E. Nicogossian, G. Wyckliffe Hoffler, Robert L. Johnson, and J. R. Hordinsky *In its* Biomed. Results from Skylab 1977 p 131-135 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

N77-33797*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
CREW EFFICIENCY ON FIRST EXPOSURE TO ZERO-GRAVITY
Owen K. Garriott and Gary L. Doerre *In its* Biomed Results from Skylab 1977 p 155-162 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06S

N77-33798*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MINERAL AND NITROGEN METABOLIC STUDIES, EXPERIMENT M071
G. Donald Whedon (Natl. Inst. of Health), Leo Lutwak (Calif. Univ., Los Angeles), Paul C. Rambaut, Michael W. Whittle, Malcolm C. Smith, Jr., Jeanne Reid (Natl. Inst. of Health), Carolyn S. Leach, Connie Rae Stadler (Technol., Inc., Houston), and Deanna D. Sanford (Technol., Inc., Houston) *In its* Biomed. Results from Skylab 1977 p 164-174 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

N77-33799*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PHYSIOLOGICAL MASS MEASUREMENTS IN SKYLAB
William E. Thornton and John Ord (Dept. of the AF, Scott AFB, Ill.) *In its* Biomed. Results from Skylab 1977 p 175-182 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

N77-33800*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
BONE MINERAL MEASUREMENT: EXPERIMENT M078
Malcolm C. Smith, Jr., Paul C. Rambaut, John M. Vogel (Calif. Univ., Davis), and Michael W. Whittle *In its* Biomed. Results from Skylab 1977 p 183-190 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

N77-33801*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MUSCULAR DECONDITIONING AND ITS PREVENTION IN SPACE FLIGHT
William E. Thornton and John A. Rummel *In its* Biomed. Results from Skylab 1977 p 191-197 ref (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

N77-33802*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
BIOSTEREOMETRIC ANALYSIS OF BODY FORM
Michael W. Whittle, Robin Herron (Tex. Inst. for Rehabil. and Res.), and Jaime Cuzzi *In its* Biomed. Results from Skylab 1977 p 198-202 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-00648-9 CSCL 06P

N77-33803*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
BIOCHEMICAL RESPONSES OF THE SKYLAB CREWMEN: AN OVERVIEW
Carolyn S. Leach and Paul C. Rambaut *In its* Biomed. Results from Skylab. 1977 p 204-216 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-00648-9 CSCL 06P

N77-33804*# Texas Univ., Galveston. Medical Branch.
CYTOGENETIC STUDIES OF BLOOD, EXPERIMENT M111
Lillian H. Lockhart *In* NASA. JSC Biomed. Results from Skylab 1977 p 217-220 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

N77-33805*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE RESPONSE OF SINGLE HUMAN CELLS TO ZERO-GRAVITY
P. OB. Montgomery, Jr. (Dallas County Hosp. District), J. E. Cook (Dallas Count Hosp. District), R. C. Reynolds (Tex. Univ., Dallas), J. S. Paul (Dallas County Hosp. District), L. Hayflick, D. Stock (Tex. Univ., Houston), W. W. Shulz (Dallas County Hosp. District), S. L. Kimzey, R. G. Thirolf, T. Rogers et al *In its* Biomed. Results from Skylab 1977 p 221-234 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06S

N77-33806*# Baylor Univ., Houston, Tex. Coll. of Medicine.
BLOOD VOLUME CHANGES
Philip C. Johnson, Theda B. Driscoll, and Adrian D. LeBlanc *In* NASA. JSC Biomed. Results from Skylab 1977 p 235-241 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

N77-33807*# Missouri Univ., Columbia.
RED CELL METABOLISM STUDIES ON SKYLAB
Charles E. Mengel *In* NASA. JSC Biomed. Results from Skylab 1977 p 242-248 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

N77-33808*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
HEMATOLOGY AND IMMUNOLOGY STUDIES
Stephen L. Kimzey *In its* Biomed. Results from Skylab 1977 p 249-282 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06E

N77-33809*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LOWER BODY NEGATIVE PRESSURE: THIRD MANNED SKYLAB MISSION
Robert L. Johnson, G. Wykliffe Hoffler, Arnauld E. Nicogossian, Stuart A. Bergman, Jr., and Margaret M. Jackson *In its* Biomed. Results from Skylab 1977 p 284-312 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06S

N77-33810*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
VECTORCARDIOGRAPHIC RESULTS FROM SKYLAB MEDICAL EXPERIMENT M092: LOWER BODY NEGATIVE PRESSURE
G. Wylkliffe Hoffler, Robert L. Johnson, Arnauld E. Nicogossian, Stuart A. Bergman, Jr., and Margaret M. Jackson *In its* Biomed.

Results from Skylab 1977 p 313-323 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

N77-33811*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
HEMODYNAMIC STUDIES OF THE LEGS UNDER WEIGHTLESSNESS
William E. Thornton and G. Wylkliffe Hoffler *In its* Biomed. Results from Skylab 1977 p 324-329 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06S

N77-33812*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ANTHROPOMETRIC CHANGES AND FLUID SHIFTS
William E. Thorton, G. Wyckliffe Hoffler, and John A. Rummel *In its* Biomed. Results from Skylab 1977 p 330-338 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06S

N77-33813*# Vanderbilt Univ., Nashville, Tenn.
VECTORCARDIOGRAPHIC CHANGES DURING EXTENDED SPACE FLIGHT (M093): OBSERVATIONS AT REST AND DURING EXERCISE
Raphael F. Smith, Kevin Stanton (Naval Aerospace Med. Inst., Pensacola, Fla.,), David Stoop (Naval Aerospace Med. Inst., Pensacola, Fla.), Donald Brown (Naval Aerospace Med. Inst., Pensacola, Fla.), Walter Janusz, and Paul King *In* NASA. JSC Biomed. Results from Skylab 1977 p 339-350 refs (For primary document see N77-33780 24-51)
Avail: NTIS HC A02/MF A01 CSCL 06S

N77-33814# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EVALUATION OF THE ELECTROMECHANICAL PROPERTIES OF THE CARDIOVASCULAR SYSTEM AFTER PROLONGED WEIGHTLESSNESS
Stuart A. Bergman, Jr., Robert L. Johnson, and G. Wyckliffe Hoffler *In its* Biomed. Results from Skylab 1977 p 351-365 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

N77-33815*# National Institutes of Health, Bethesda, Md.
EFFECT OF PROLONGED SPACE FLIGHT ON CARDIAC FUNCTION AND DIMENSIONS
Walter L. Henry, Stephen E. Epstein, James M. Griffith, Robert E. Goldstein, and David R. Redwood *In* NASA., JSC Biomed. Results from Skylab 1977 p 366-371 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06S

N77-33816*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
RESULTS OF SKYLAB MEDICAL EXPERIMENT M171-METABOLIC ACTIVITY
Edward L. Michel, John A. Rummel, Charles F. Sawin, Melvin C. Buderer (Life Sciences Div. Technol. Inc., Houston, Tex.), and John D. Lem *In its* Biomed. Results from Skylab 1977 p 372-387 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 003-000-00648-9 CSCL 06P

N77-33817*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PULMONARY FUNCTION EVALUATION DURING AND FOLLOWING SKYLAB SPACE FLIGHTS
Charles F. Sawin, Arnauld E. Nicogossian, A. Paul Schachter (Technol. Inc., Houston, Tex.), John A. Rummel, and Edward L. Michel *In its* Biomed. Results from Skylab 1977 p 388-394 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 003-000-00648-9 CSCL 06P

N77-33818*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
METABOLIC COST OF EXTRAVEHICULAR ACTIVITIES
James M. Waligora and David J. Horrigan, Jr. *In its* Biomed. Results from Skylab 1977 p 395-399 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

N77-33819*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DETERMINATION OF CARDIAC SIZE FROM CHEST ROENTGENOGRAMS FOLLOWING SKYLAB MISSIONS
Arnauld E. Nicogossian, G. Wyckliffe Hoffler, Robert L. Johnson (USAF Academy, Colorado Springs, Colo.), and Richard J. Gowen *In its* Biomed. Results from Skylab 1977 p 400-405 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06P

N77-33821*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LOWER BODY NEGATIVE PRESSURE DEVICE
Robert W. Nolte *In its* Biomed. Results from Skylab 1977 p 421-423 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

N77-33822*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
AUTOMATIC BLOOD PRESSURE MEASURING SYSTEM (M091)
Robert W. Nolte *In its* Biomed. Results from Skylab 1977 p 424-427 refs
(For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

N77-33823*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
AUTOMATIC BLOOD PRESSURE MEASURING SYSTEM (M092)
Robert W. Nolte *In its* Biomed. Results from Skylab 1977 p 428-432 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

N77-33824*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
VECTORCARDIOGRAPH
John Lintott and Martin J. Costello (Martin Marietta Aerospace, Denver, Colo.) *In its* Biomed. Results from Skylab 1977 p 441-444 ref (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

N77-33825*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
A.I.e. IN-FLIGHT BLOOD COLLECTION SYSTEM
John M. Hank *In its* Biomed. Results from Skylab 1977 p 433-435 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

N77-33826*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ERGOMETER
John D. Lem *In its* Biomed. Results from Skylab 1977 p 436-440 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

N77-33827*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
METABOLIC ANALYZER
John D. Lem *In its* Biomed. Results from Skylab 1977 p 445-447 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

N77-33828*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
BODY TEMPERATURE MEASURING SYSTEM (M171)
John D. Lem *In its* Biomed. Results from Skylab 1977 p 448-449 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

N77-33829*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
HARDWARE REPORT FOR EXPERIMENT M133, SLEEP MONITORING ON SKYLAB
Cletis R. Booher and E. Fontaine LaRue (Martin Marietta Aerospace, Denver) *In its* Biomed. Results from Skylab 1977 p 450-454 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

N77-33830*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB EXPERIMENT M131: ROTATING LITTLE CHAIR
James S. Evans, Dennis L. Zitterkopf (Johns Hopkins Univ., Silver Spring, Md.), Robert L. Konigsberg (Johns Hopkins Univ., Silver Spring, Md.), and Chalres M. Blackburn (Johns Hopkins Univ., Silver Spring, Md.) *In its* Biomed. Results from Skylab 1977 p 455-458 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

N77-33831*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.,
EXPERIMENT SUPPORT SYSTEM
Albert V. Shannon *In its* Biomed. Results from Skylab 1977 p 459-462 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

N77-33832*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
IN-FLIGHT MEDICAL SUPPORT SYSTEM
Charles Chassay and Sylvia A. Rose (Boeing Co., Houston) *In its* Biomed. Results from Skylab 1977 p 463-473 refs (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

N77-33833*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
CARBON DIOXIDE/DEWPOINT MONITOR
Stanley Luczkowski *In its* Biomed. Results from Skylab 1977 p 474-477 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

N77-33834*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ATMOSPHERIC ANALYZER, CARBON MONOXIDE MONITOR AND TOLUENE DIISOCYANATE MONITOR
Albert V. Shannon *In its* Biomed. Results from Skylab 1977 p 478-480 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

N77-33835*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB HARDWARE REPORT OPERATIONAL BIOINSTRUMENTATION SYSTEM
Stanley Luczkowski *In its* Biomed. Results from Skylab 1977 p 481-484 ref (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

N77-33836*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXERCISER
John D. Lem *In its* Biomed. Results from Skylab 1977 p 485-486 (For primary document see N77-33780 24-51)
Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 06B

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N77-33854# California Univ., Berkeley. Architecture Life Safety Group.
HUMAN BEHAVIOR IN INSTITUTIONAL FIRES AND ITS DESIGN IMPLICATIONS Final Report
Lars Lerup, David Cronrath, and John Koh Chiang Liu 28 Feb. 1977 187 p refs
(Grant NBS-6-9013)
(NBS-GCR-77-93) Avail: NTIS HC A09/MF A01

Design implications were derived from the in-depth analysis of behavior in institutional settings under fire. The context and data were drawn from ten case studies of significant nursing home fires which occurred in the United States between 1970 and 1974. The methodology used is based on a graphical (Pictorial) and narrative mapping of fire and people behavior. Author

N77-33855# School of Aerospace Medicine, Brooks AFB, Tex. Aerospace Medical Div.
PSYCHOMETRIC CHARACTERISTICS OF ASTRONAUTS
Bryce O. Hartman and Richard C. McNee Mar. 1977 18 p refs
(AD-A039228; SAM-TR-5; SAM-Review-1-77167930) Avail: NTIS HC A02/MF A01 CSCL 05/9

Detailed information on the role of psychological testing in the selection process for NASA astronauts has been reported only in a fragmentary manner because of the sensitive nature of this information. With the lapse of time since the initiation of the U.S. manned space program, this information has become essentially of only historic interest. However, because of the current activity in the European space agency, where there is a requirement for astronaut selection, psychometric procedures and data are of renewed scientific interest. An overview of the psychometric process and extensive statistical analyses are reported. Author (GRA)

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N77-33856# Human Engineering Labs., Aberdeen Proving Ground, Md.
A REVIEW OF THE LITERATURE ON THE LEGIBILITY OF ALPHANUMERICS ON ELECTRONIC DISPLAYS Final Report
Andrew T. Buckler May 1977 18 p refs
(AD-A040625; HEL-TM-16-77) Avail: NTIS HC A02/MF A01 CSCL 05/5

This report reviews the available literature on the legibility of alphanumeric characters on electronic displays. The purpose was to identify the important parameters involved in legibility and to provide a summary of previous research findings in this area. Effort was made to determine the acceptability of principles derived from conventional media for applications with electronic displays. Also, new questions and problems created by electronic display technology are discussed. Conclusions are drawn and recommendations made where sufficient data are available, and further questions and problems are posed for future research. GRA

N77-33857# Texas Technological Univ., Lubbock.
IMPROVED SEAT, CONSOLE, AND WORKPLACE DESIGN: ANNOTATED BIBLIOGRAPHY, INTEGRATION OF THE LITERATURE, ACCOMMODATION MODEL, AND SEATED OPERATOR REACH PROFILES
M. M. Ayoub and C. G. Halcomb 31 Dec. 1976 348 p refs
(Contract N61756-75-M-2986)
(AD-A040479; PMTC-TP-76-1) Avail: NTIS HC A15/MF A01 CSCL 05/5

This report was prepared with the objective of integrating pertinent information regarding sear, console, and workplace design. The four sections include: (1) An annotated bibliography about seating, console, and workplace designs. Each relevant publication is summarized to reflect a category, author, title, methodology, rationale, significant results, conclusions, and recommendations; (2) Integration of the seat, console, and workplace design. The detailed aspects of these components and their relationship to each other in making up the workplace are discussed; (3) A workplace-accommodated percentage evaluation model. A model and preliminary results are presented to show the percentage excluded from a seat/console design, given the percentage excluded based on individual dimensions; and (4) Reach profiles for restrained and unrestrained males and females. Reach envelope data and new methodologies for collecting data are presented, and are compared with existing reach data. GRA

N77-33858# Human Engineering Labs., Aberdeen Proving Ground, Md.

INVESTIGATION OF INSIDE LIGHT REFLECTION PROBLEM ON THE FLAT PLATE CANOPY (FPC) FOR MODEL 209 AH-IS HELICOPTER Final Report

Harry R. Stowell and Christopher C. Smythe Apr. 1977 46 p refs

(AD-A041332; HEL-TM-13-77) Avail: NTIS HC A03/MF A01 CSCL 01/3

Various approaches were examined for a possible solution to the light-reflection problem inside the Model 2 AH- Is helicopter cockpit with the flat-plate canopy FPC. A computer program was developed to identify primary light reflections inside the FPC at the pilot's eye position. Modifying the side panels on the FPC with curved surfaces may be the only satisfactory solution to the inside light-reflection problem. Author (GRA)

N77-33859# Aerospace Research Labs., Wright-Patterson AFB, Ohio.

A SPATIAL FREQUENCY ANALYSIS MODEL FOR PREDICTING HUMAN PERFORMANCE AT VISUAL PATTERN MATCHING TASKS

Mark W. Cannon, Jr. Jun. 1977 8 p refs Presented at Systems, Man and Cybernetics Soc., Washington, D. C., 19-21 Sep. 1977 Submitted for publication

(AD-A041649; AMRL-TR-77-43) Avail: NTIS HC A02/MF A01 CSCL 05/8

A model for simulating human performance in visual pattern matching tasks is presented. The model is based on evidence of spatial frequency processing in the visual system, and on the hypothesis that shape recognition is determined only by the low spatial frequency harmonics of the image. Two psychophysical pattern matching experiments are described that demonstrate a clear functional relationship between the 'similarity' of two patterns as judged by human observers and the Euclidean distance between spatially filtered Fourier transforms of the patterns.Author (GRA)

N77-33860# Air Force Human Resources Lab., Brooks AFB, Tex. Advanced Systems Div.

EFFECTS OF VISUAL PROPRIOCEPTIVE CUE CONFLICTS ON HUMAN TRACKING PERFORMANCE Ph.D. Thesis - Ohio State Univ.

Lawrence E. Reed Jun. 1977 226 p refs

(AD-A042006; AFHRL-TR-77-3223) Avail: NTIS HC A11/MF A01 CSCL 17/8

The purpose of this experiment was to investigate operator performance in an environment which was highly conducive to visual-proprioceptive conflict. The experimental task required that subjects maneuver a simulated remotely piloted vehicle from a simulated airborne control station (i.e., 'mother ship'). The vehicle and/or the station were given gust-like disturbances on pitch and/or roll. In a between groups design the performance of pilots, navigators, and non-rated Air Force officers was compared under conditions of conflict (e.g., visual roll right and roll left motion), non-conflict, motion only, and no motion. To maintain adequate performance it was neccessary for the subjects to disregard sensations of motion. The results revealed that the conditions of conflict engendered the highest proportion of reversal errors by all subjects. The past experience of pilots did not help them overcome the effects of conflict as measured by reversal errors, but it did help them reduce response latencies. The effects of practice were evidenced primarily by a reduction of reversal errors under conditions of conflict. Strong evidence was found to support the notion that motion plays an alerting function and also provides information on the direction of attitude changes. Author (GRA)

N77-33861# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Physik der Atmosphaere.

THE MAXIMUM DETECTION RANGE AND THE MAXIMUM RECOGNITION DISTANCE WHEN OBSERVING GROUND TARGETS FROM HELICOPTERS

H.-E. Hoffmann and R. H. Buell 10 Aug. 1976 73 p refs In GERMAN; ENGLISH summary

(DLR-IB-553-76/3) Avail: NTIS HC A04/MF A01

The visibility of ground targets (tank Leopard or 1.5 t truck) was studied by observation from a helicopter. Observation was done mostly with the naked eye; for some approaches, however, 8 x 30 binoculars were used. Continuous approaches and observations with the naked eye resulted in the following: the maximum detection range for approaches from a northern direction was up to more than 3 km larger than for approaches from a southern direction; the differences for the maximum recognition range were up to 3 km. At horizontal standard visibilities between 18 and 30 km the maximum detection range was between 3 and 4 km, the maximum recognition range being between 2 and 2.5 km. When hovering and observing with the naked eye, the following results were obtained: if in daylight the target is detected from 4.6 km, 15 min after sunset the detection distances were 3.2 to 2.1 km. The recognition distance was 1.7 km in daylight and 0.8 km 15 minutes after sunset.

Author (ESA)

N77-33862# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Physik der Atmosphaere.

SOME TEST RESULTS ON THE VISIBILITY OF OBSTACLE AND HAZARD BEACONS

H.-E. Hoffmann and R. H. Buell 21 Sep. 1976 39 p refs In GERMAN; ENGLISH summary

(DLR-IB-553-76/5) Avail: NTIS HC A03/MF A01

The maximum detection range when observing a 100 W and a 150 W obstacle beacon and a 1000 W hazard beacon (rotation beacon) was determined from an approaching helicopter. The following results were found: during sunset and horizontal standard visibilities of 10 to 13 km, the 150 W obstacle beacon was detected at distances of 3.5 to 5 km; during nighttime the maximum detection range for the 150W obstacle beacon increased to 6 to 14 km; the fluctuation of the maximum detection range, most likely caused by unperceived inhomogenities of the atmosphere was at maximum 7 km; significant differences between the maximum detection ranges for the 100 W and the 150 W obstacle beacon were not registered; and the maximum detection range for the 1000 W hazard beacon was between 3 and 8 km larger than for the two obstacle beacons.

Author (ESA)

N77-33863# Technische Hochschule, Darmstadt (West Germany). Fachbereich Informatik.

INTERACTIVE SYSTEM DESIGN CONSIDERATIONS [BETRACHTUNGEN ZUM ENTWURF INTERAKTIVER SYSTEME]

Hans-Juergen Hoffmann Dec. 1976 68 p refs In GERMAN; ENGLISH summary Presented at the Symp. on Interactive Systems, Bad Homburg, West Ger., 22-24 Sep. 1976

(PU1R2/76) Avail: NTIS HC A04/MF A01

Requirements to be fulfilled by interactive systems are discussed, and some system components are presented which cooperatively allow realization of some desirable properties of the system operation. Author (ESA)

N77-33864# Michigan Univ., Ann Arbor. Highway Safety Research Inst.

TOLERANCE AND RESPONSE OF THE KNEE-FEMUR-PELVIS COMPLEX TO AXIAL IMPACT

J. W. Melvin and R. L. Stalnaker 1976 52 p refs Sponsored by Motor Vehicle Mfr. Assoc. of the United States, Inc.

(PB-269059/2; UM-HSRI-76-33) Avail: NTIS HC A04/MF A01 CSCL 05H

The tolerance and response of the human patella-femur-pelvis complex to axial impact force applied to the knee of seated vehicle occupants is defined. The results of direct impact and driving point impedance measurments of the flexed legs of seated unembalmed human cadavers is presented. Comparisons of the cadaver responses are made with similar tests on a test dummy. A total of 58 individual impact tests to the knees of cadavers were conducted for various impact test conditions--rigid, lightly padded and thickly padded impact surfaces. Accident investigation data analysis is used as an aid to interpreting the test results. GRA

N77-33865# Michigan Univ., Ann Arbor. Highway Safety Research Inst.

GUIDEBOOK ON ANTHROPOMORPHIC TEST DUMMY USAGE Final Report, Jul. 1976 - Mar. 1977

D. H. Robbins 31 Mar. 1977 84 p refs

(Grant NBS-6-9011)

(PB-268904/0; UM-HSRI-BI-77-19; NBS-GCR-77-91) Avail: NTIS HC A05/MF A01 CSCL 14B

The role of impact test dummies in developing countermeasures to cope with the high incidence of safety problems related to building structures is discussed. Dummies are classified according to sophistication ranging from anthropometric form to impact body blocks and finally to sophisticated anthropomorphic test devices used in automotive safety. Test procedures and data processing are discussed. A bibliography, coded by subject, is also included. GRA

N77-33866# Boeing Computer Services, Inc., Seattle, Wash. Energy Technology Applications.

PROMETHEUS 2: A USER ORIENTED PROGRAM FOR HUMAN CRASH DYNAMICS Final Report, Jun. 1973 - Aug. 1976

David W. Twigg Jun. 1977 212 p refs

(Contract DOT-HS-356-3-719)

(PB-269305/9; BCS-G0802; DOT-HS-802-423) Avail: NTIS HC A10/MF A01 CSCL 13F

Simulation of a pedestrian being struck in the side by the front of an automobile was conducted using a mathematical model composed of eleven linked rigid segments. A nonlinear finite element model of the vehicle structure is incorporated which interacts realistically with the victim. Various restraint systems can be simulated. PROMETHEUS 2 input aids include free field data input and an on-line data edit capability. Output provides user selected time-history and occupant configuration plots as well as abbreviated output lists for a rapid scan of results. GRA

N77-33782*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

FLIGHT CONTROL EXPERIENCES

F. Story Musgrave *In its* Biomed. Results from Skylab 1977 p 20-21 (For primary document see N77-33780 24-51)

Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 05H

N77-33796*# Fordham Univ., New York.

TASK AND WORK PERFORMANCE ON SKYLAB MISSIONS 2, 3, AND 4: TIME AND MOTION STUDY: EXPERIMENT M151

Joseph F. Kubis, Edward J. McLaughlin (Tex. Univ., Houston), Janice M. Jackson, Rudolph Rusnak, Gary H. McBride, and Susan V. Saxon *In* NASA. JSC Biomed. Results from Skylab 1977 p 136-154 ref (For primary document see N77-33780 24-51)

Avail: NTIS MF A01; SOD HC as 033-000-00648-9 CSCL 05H

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering.*

N77-33867*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Information Systems Div.

MICROPROCESSOR SEMINAR, PHASE 2

W. Richard Scott 15 Aug. 1977 170 p refs Seminar held at Pasadena, Calif., Apr. 1977

(Contract NAS7-100)

(NASA-CR-155164; JPL-Pub-77-39) Avail: NTIS HC A08/MF A01 CSCL 09B

Workshop sessions and papers were devoted to various aspects of microprocessor and large scale integrated circuit technology. Presentations were made on advanced LSI developments for high reliability military and NASA applications. Microprocessor testing techniques were discussed, and test data were presented. High reliability procurement specifications were also discussed. Author

N77-33868*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

FAULT TOLERANT COMPUTING: A PREAMBLE FOR ASSURING VIABILITY OF LARGE COMPUTER SYSTEMS

Raymond S. Lim Oct. 1977 25 p refs

(NASA-TP-1067; A-7072) Avail: NTIS HC A02/MF A01 CSCL 09B

The need for fault-tolerant computing is addressed from the viewpoints of (1) why it is needed; (2) how to apply it in the current state of technology, and (3) what it means in the context of the Phoenix computer system and other related systems. To this end, the value of concurrent error detection and correction is described. User protection, program retry, and repair are among the factors considered. The technology of algebraic codes to protect memory systems and arithmetic codes to protect arithmetic operations is discussed. Author

N77-33869*# North Carolina Science and Technology Research Center, Research Triangle Park.

THE BIOSIS DATA BASE: EVALUATION OF ITS INDEXES AND THE STRATBLDR, CHEMFILE, STAIRS AND DIALOG SYSTEMS FOR ON-LINE SEARCHING

Monica Nees and Hannah O. Green Washington NASA Sep. 1977 69 p refs

(Contract NAS1-14208)

(NASA-CR-2893; STR-508) Avail: NTIS HC A04/MF A01 CSCL 09B

An IBM-developed program, STAIRS, was selected for performing a search on the BIOSIS file. The evaluation of the hardware and search systems and the strategies used are discussed. The searches are analyzed by type of end user. Author

N77-33870# Naval Postgraduate School, Monterey, Calif.

INVESTIGATION OF CARD PROGRAMMABLE AND CHIP PROGRAMMABLE POCKET CALCULATORS AND CALCULATOR SYSTEMS FOR USE AT NAVAL POST-GRADUATE SCHOOL AND IN THE NAVAL ESTABLISHMENT M.S. Thesis

Harry Rudolph Kruse and Hugh Alan Burkett Mar. 1977 191 p refs
(AD-A041067) Avail: NTIS HC A09/MF A01 CSCL 09/2

This thesis investigates the usefulness of card programmable pocket calculators in the Management curricula of the Naval Postgraduate School and in the fleet, based upon manufacturer-provided information on the HP-67, HP-97, SR-52, TI-59, and NS-7100 calculators; NPS classroom experimentation; hands on programming of the HP-67 and SR-52; interviews; and the literature. All aspects of calculator functions, programming and programmability are surveyed with particular emphasis on educational and practical applications. Thus, this is a baseline document for study by potential purchasers and users. This study concludes that these machines provide significant advantages in teaching or learning mathematical concepts and that the pocket calculator is a potentially important management and tactical support tool navy-wide. In addition, thinking process transmutation, discovered during this study, is concluded to be an inevitable and important by-product of calculator programming which significantly improves the user's overall analytic capacity. Author (GRA)

N77-33871# California Univ., Los Angeles. Campus Computing Networks.
AN IMPLEMENTATION OF THE MSG INTERPROCESS COMMUNICATION PROTOCOL Semiannual Technical Report, 1 Jul. - 31 Dec. 1976
L. P. Rivas, H. C. Ludlam, and R. T. Braden May 1977 136 p refs
(Contract MDA903-74-C-0083; ARPA Order 2543)
(AD-A041630; CCN/TR12) Avail: NTIS HC A07/MF A01 CSCL 09/2

This report covers technical development at UCLA-CCN relating to the National Software Works (NSW), during the period July 1, 1976, through December 31, 1976, and is specifically concerned with the CCN implementation of MSG, the interprocess communication mechanism for the NSW. MSG is a message-oriented protocol which also provides subsidiary connection-oriented facilities. PL/MSG, the process-callable interface to CCN's MSG, is an access method designed particularly for use by PL/I programs. The later sections of the report describe the internal design and logic of the CCN implementation, in increasing detail and specificity. GRA

N77-33872# Illinois Univ., Urbana-Champaign. Coordinated Science Lab.
MEMORY ORGANIZATIONS AND THEIR EFFECTIVENESS FOR MULTIPROCESSING COMPUTERS Ph.D. Thesis
Faye Alaye Briggs May 1977 207 p refs
(Contracts DAAB07-72-C-0259; NSF MCS-73-03488)
(AD-A042646; R-768; UILU-eng-77-2215) Avail: NTIS HC A10/MF A01 CSCL 09/2

The object of this research is to develop a flexible semiconductor memory organization for parallel-pipelined processors and investigate the effect of memory interference on the system performance for a variety of module characteristics, processor orders and memory configurations. GRA

N77-33873# California Univ., Livermore. Lawrence Livermore Lab.
UXDD80 GRAPHIC SYSTEM
Mark Blair Jan. 1977 32 p refs
(Contract W-7405-eng-48)
(UCID-30146) Avail: NTIS HC A03/MF A01

A system of graphics software for use with FORTRAN plotting programs is described. It consists of libraries containing subroutines that may be used in conjunction with dd80 plotting routines to construct a program that will output pictures in the form of a general purpose graphics data base and a family of utility programs that process pictures from the data base to display and/or output them in an assortment of forms on various graphics devices. Output devices include television monitors and several varieties of electrostatic printers. The system's fundamental strength lies in the nature of its data base, which is both simple and device independent. The software is available from the public file system of the Octopus timesharing network, for use on any of its four CDC 7600 computers. ERA

N77-33874# Central Piedmont Urban Observatory, Charlottesville, Va. Dept. of Applied Mathematics and Computer Science.
A USER'S GUIDE TO THE SYSTEM/3 DATA BASE MANAGEMENT SYSTEM (S3DBMS)
W. Joseph Berman and Seymour E. Goodman Jan. 1977 31 p Prepared in cooperation with Natl. League of Cities, Washington, D. C.
(Contract HUD-H-2196R)
(PB-268875/2; UO-LCCM-CHA-77-008) Avail: NTIS HC A03/MF A01 CSCL 09B

This user's guide is written for use with the System/3 Database Management System (S3DBMS), a self-contained system that facilitates simple information storage/retrieval operations and includes variable-length capability and a command-driven interpreter. The system was developed for use with the City of Charlottesville's IBM System/3 computer. A description of the components of the computer and the steps necessary to start up, interact with and shut down the computer; the basic commands for controlling the computer; an explanation of the processes of data addition, removal and replacement; and a description of data retrieval are included. A sample session using the S3DBMS is also appended. GRA

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N77-33875*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Tracking and Data Acquisition Engineering Div.
REVIEW OF FINITE FIELDS: APPLICATIONS TO DISCRETE FOURIER TRANSFORMS AND REED-SOLOMON CODING
J. S. L. Wong, T. K. Truong (Southern Calif. Univ.), B. Benjauthrit, B. D. L. Mulhall, and I. S. Reed 15 Jul. 1977 32 p refs
(Contract NAS7-100)
(NASA-CR-155167; JPL-Pub-77-23) Avail: NTIS HC A03/MF A01 CSCL 09B

An attempt is made to provide a step-by-step approach to the subject of finite fields. Rigorous proofs and highly theoretical materials are avoided. The simple concepts of groups, rings, and fields are discussed and developed more or less heuristically. Examples are used liberally to illustrate the meaning of definitions and theories. Applications include discrete Fourier transforms and Reed-Solomon coding. Author

N77-33876*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
STANDARDIZATION, CERTIFICATION, MAINTENANCE, AND DISSEMINATION OF LARGE SCALE ENGINEERING SOFTWARE SYSTEMS
Theodore G. Toridis, ed. (George Washington Univ., Washington, D.C.), Harvey G. McComb, Jr., ed., and Khalil Khozeimeh, ed. (George Washington Univ., Washington, D.C.) Sep. 1977 103 p refs Panel Discussion Held at Washington, D.C., 29-31 Mar. 1976; sponsored by NASA and NSF
(NASA-CP-2015; L-11771) Avail: NTIS HC A06/MF A01 CSCL 09B

A verbatim transcript of the discussion by panel members is presented. Author

N77-33877# Army Mobility Equipment Research and Development Center, Fort Belvoir, Va.
COMPUTER TECHNOLOGY IN MATERIALS ANALYSIS. PART 1: METALS AND ALLOYS Interim Report
Frank L. Harris May 1977 22 p refs
(AD-A041031; MERADCOM-2210) Avail: NTIS HC A02/MF A01 CSCL 07/4

A system is described for computer processing of data obtained from photographed optical emission spectra of metals and alloys. Samples of computer-produced emulsion calibration curves and element concentration calibration curves are provided. A digital scanning densitometer acquired for more complete automation of the system is also discussed. Author (GRA)

N77-33878# Naval Postgraduate School, Monterey, Calif.
AN APPLICATION OF CP/CMS TO THE TIME SERIES ANALYSIS M.S. Thesis
Young Woo Lee Mar. 1977 112 p refs
(AD-A041178) Avail: NTIS HC A06/MF A01 CSCL 09/2

An interactive package of computer programs has been developed for the anlaysis of time series data. The package, called the Time Series Editor, is designed around the Box-Junkins, statistical methodology of time series analysis. The Time Series Editor was developed for time-shared use on the Controlled Program/Cambridge Monitor System (CP/CMS) but could be easily modified to accommodate other time-sharing systems. The Time Series Editor assists in data preparation, entry, analysis and diagnostic testing. Utilization of the package requires only a limited knowledge of the computer system with all required user responses prompted by the Editor. Author (GRA)

N77-33879# University of Southern Calif., Marina del Rey. Information Sciences Inst.
INFORMALITY IN PROGRAM SPECIFICATIONS
Robert Balzer, Neil Goldman, and David Wile Apr. 1977 29 p refs
(Contract DAHC15-72-C-0308; ARPA Order 2223)
(AD-A041669; ISI/RR-77-59) Avail: NTIS HC A03/MF A01 CSCL 09/2

This work is concerned primarily with (1) the procedure by which process-oriented specifications are obtained from goal-oriented requirement specifications and (2) computer based tools for their construction. It first determines some attributes of a suitable process-oriented specification language, then examines the reasons why specifications would still be difficult to write in such a language. The key to overcoming these difficulties seems to be the careful introduction of informality (i.e., partial, rather than complete, descriptions and the use of a computer-based tool that uses context extensively to complete these descriptions during the process of constructing a well-formed specification). Some results obtained by a running prototype of such a computer-based tool on a few informal example specifications are presented and, finally, some of the techniques used by this prototype system are discussed. Author (GRA)

N77-33880# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
INTELLIGENT ON-LINE ASSISTANT AND TUTOR SYSTEM Final Technical Report, 18 Sep. 1975 - 31 Jan. 1977
William L. Ash, Robert J. Bobrow, Mario C. Grignetti, and Alice K. Hartley 31 Jan. 1977 120 p
(Contract N00014-76-C-0476; ARPA Order 3091)
(AD-A041727; BBN-3607) Avail: NTIS HC A06/MF A01 CSCL 05/9

This report describes work performed to develop a system to help people who are not computer experts deal with their Intelligent Terminal, an envisioned personal computer of great sophistication and power. The system was aimed at being capable of mediating 'intelligently' between these users and the tools that could be available to them in the Intelligent Terminal: provide streamlined instruction on how to use these tools, answer questions posed in English about the tools, and request that certain actions described in English be performed using the tools. The system is written in INTERLISP. The report describes in detail the work performed to bring up INTERLISP on a DEC-PDP-11 computer, and the work performed on an Intelligent On-Line Assistant and Tutor (INLAT) for new users of HERMES, an independently developed message processing system that exemplifies the kind of tool that could be made available in future Intelligent Terminals. Author (GRA)

N77-33881# California Univ., Los Angeles. Campus Computing Network.
A TOOL-BEARING HOST IN THE NATIONAL SOFTWARE WORKS Semiannual Technical Report, 1 Dec. 1975 - 30 Jun. 1976
R. T. Braden and H. C. Ludlam 1 Apr. 1977 74 p refs
(Contract MDA903-74-C-0083; ARPA Order 2543)
(AD-A041652; CN/TR10) Avail: NTIS HC A04/MF A01 CSCL 09/2

This report describes the technical development relating to the National Software Works (NSW) at UCLA-CCN during the period December 1, 1975 through June 30, 1976. The NSW is a distributed multi-computer operating system based on the ARPANET. The primary goal of the NSW project at CCN is to make the CCN 360/91 a 'tool-bearing host' within the NSW. Section 2 of this report describes the further development of the batch job facility for the NSW. Section 3 deals with the installation of batch tools at CCN. Section 4 describes research relating to the design of the file-movement mechanism for NSW, the File Package. Author (GRA)

N77-33882# California Univ., Santa Cruz. Information Sciences.
BOOTSTRAPPING A SMALL TRANSLATOR WRITING SYSTEM
28 Mar. 1977 56 p refs
(Contract N00014-76-C-0682)
(AD-A041632; TR-77-002) Avail: NTIS HC A04/MF A01 CSCL 09/2

A rudimentary translator writing system is developed for easy implementation in about 2 pages of assembly language code. Although the system is based on backtrack parsing and lacks a scanner, it still performs useful translations in a few minutes of CPU time, with storage requirements of about 10K bytes, for a typical translation. The system is based on a ALGOL-like program by Michels which translates source language strings into target language strings, according to translation grammar which is specified using prefix Polish operators. Fortunately, the user does not need to specify translation grammars in Polish notation, because Michels gave a metagrammar which translates grammars in BNF-like notation (including the metagrammar itself) into Polish strings. This report shows how Michels' program can be implemented without the aid of an ALGOL compiler. GRA

N77-33883# Michigan Univ., Ann Arbor. Dept. of Electrical and Computer Engineering.
VECTOR PROCESSING IN SIMULATION Interim Report
D. A. Calahan 22 Apr. 1977 7 p
(Grant AF-AFOSR-0800-77)
(AD-A041747; AFOSR-77-0800TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The availability of large scientific computers specially designed to solve problems 100-1000 times faster than current conventional processors will shortly open new opportunities to simulation-oriented research. This paper presents the attributes of problems commonly solved on such machines, presents simplified mathematical models and corresponding methods of evaluating their performance, and gives results of benchmark studies.
Author (GRA)

N77-33884# TRW Defense and Space Systems Group, Redondo Beach, Calif.
THE SOFTWARE DESIGN AND VERIFICATION SYSTEM (SDVS) Final Report, 17 Jun. - 30 Jun. 1976
M. E. Hollowich and M. G. McClimens May 1977 92 p refs Supersedes AFAL-TR-75-31
(Contract F33615-74-C-1159)
(AD-A042126; AFAL-TR-76-200; AFAL-TR-75-31) Avail: NTIS HC A05/MF A01 CSCL 09/2

Athe AFAL Digital Avionics Information System (DAIS)will become a test bed for evaluation of complex avionics systems architecture. The Software Design and Verification System (SDVS) has been developed as a highly transportable set of avionic software development and management tools to support DAIS and other software development centers. SDVS automates and controls mission software configuration management, simulation, data base management, and test and evaluation functions. This report presents an explanation of what DAIS is and the role of SDVS in this program. The various SDVS functions available are presented in addition to a description of the development methodolgy used for the design, development, and validation of the SDVS. The methodolgy included application of top-down design, development, and test techniques, in addition to the use of structured programming concepts. Author (GRA)

N77-33885# System Development Corp., Santa Monica, Calif.
AN INVESTIGATION OF PROGRAMMING PRACTICES IN SELECTED AIR FORCE PROJECTS Final Technical Report, Apr. 1976 - Apr. 1977
Grover H. Perry and Norman E. Willmorth Griffiss AFB, N. Y.

RADC Jun. 1977 231 p refs
(Contract F30602-76-C-0180)
(AD-A041678; SDC-TM-L-5839/000/00; RADC-TR-77-182)
Avail: NTIS HC A11/MF A01 CSCL 09/2

The overall objective of the Evaluation of Standard Programming Practices study is to assist RADC in the assessment of the effects of Modern Programming Practices (MPPs) on the development of large systems produced for the Department of Defense (DoD). The objective is met here by performing case studies on two projects. First a broad band evaluation is made of a variety of techniques applied to a high technology space surveillance system (COBRA DANE). Second, the results obtained in applying a very powerful development and management tool (the Air Force Satellite Control Facility's COMPOOL-Sensitive System) to a very complex and difficult software integration task are described. These are two entirely different levels of detail in assessing MPPs but both serve to illustrate the close relationship between applied software development technology and proper software project management. Both are essential if goals of increased programming productivity and improved software quality are to be achieved. GRA

N77-33886# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.

DOVE, A RATIONAL ANALYSIS OF SPARSE DATA

Peter F. Strong, C. Gardner Swain, and Marguerite S. Swain 15 Jul. 1977 24 p refs
(Contract N00014-67-A-0204-0075)
(AD-A042638; Rept-11; TR-1) Avail: NTIS HC A02/MF A01 CSCL 12/1

Realistic parameters are attainable in spite of missing data. DOVE can be useful, even when many or most data are missing, for generalized least squares fitting to evaluate a self-consistent set of all parameters in an expression for predicting all missing data, and without changing the predicted data, to transform the set of parameters obtained in phase 1 so that each final parameter has a simple, pure, realistic, physical meaning. Since predicted data are expressed as a(i)x(j)-b(i)y(j)-...-c(i) with n product terms, phase 2 requires incorporation of n squared - n independent subsidiary conditions, of which 2n are arbitrary, i.e., merely fix zero reference points and scale unit sizes, but n squared - n are critical, i.e., must be relationships between particular parameters supported by other information. Both phases are illustrated by a two-mode application with 7 i, 10 j, hence 41 parameters, to fit the data plus the 6 subsidiary conditions. Valid parameters are obtained although 30 of the 70 possible data are missing. GRA

N77-33887# Technische Hochschule, Darmstadt (West Germany). Fachbereich Informatik.

WRITING STRUCTURED PROGRAMS IN DIALOG MODE [ERSTELLUNG STRUKTURIERTER PROGRAMME IM DIALOG]

Detlef Muth Aug. 1976 35 p refs In GERMAN; ENGLISH summary
(PU1R4/74) Avail: NTIS HC A03/MF A01

A programming system PAD is described. It supports the programmer in formulating structured programs in a dialog mode. The system guarantees that the control structures of the programs formulated are syntactically correct. The rules of syntax are stored in tables. These tables can be adapted to any programming language. An example is given of how to formulate a program with PAD. Techniques fulfilling the specified qualities are demonstrated. Author (ESA)

N77-33888# Technische Hochschule, Darmstadt (West Germany). Fachbereich Informatik.

WRITING RELIABLE PROGRAMS [UEBER DAS ERSTELLEN ZUVERLAESSIGER PROGRAMME]

Adelbert Mueller Dec. 1975 37 p refs In GERMAN; ENGLISH summary Presented at the Colloq. on Informatics, Darmstadt, West Ger., 20 Oct. 1975
(PU1R4/75) Avail: NTIS HC A03/MF A01

Several methods to write reliable programs are discussed. Reliable programs are characterized and the effects of bad and good programming style on the reliability of programs are compared. Program verification and verification systems are briefly reviewed. Possible applications of an interactive system, PAD, are proposed. Author (ESA)

N77-33889# Technische Hochschule, Darmstadt (West Germany). Fachbereich Informatik.

FIRST STUDY OF JOB CONTROL LANGUAGES [EINE ERSTE STUDIE UEBER BETRIEBSSPRACHEN]

Hans-Juergen Hoffmann and Hans H. Kron Sep. 1976 39 p refs In GERMAN; ENGLISH summary
(PU1R3/76) Avail: NTIS HC A03/MF A01

The syntactic appearance and semantic structure of job control languages are discussed. Some ideas are presented for interactive composition of jobs to be performed by a computer system which, combined with a flexible syntactic appearance of the job control language, offer a capable semantic structure. The semantic structure is demonstrated by means of a composition model, as manipulation of bindings between objects which combine the resources for doing jobs in an unified, abstract manner. Author (ESA)

N77-33890# Howden (William E.), Solana Beach, Calif.

SYMBOLIC TESTING: DESIGN TECHNIQUES, COSTS AND EFFECTIVENESS Final Report

William E. Howden May 1977 229 p refs Sponsored by NBS
(PB-268517/0; NBS-GCR-77-89) Avail: NTIS HC A11/MF A01 CSCL 09B

The design of a symbolic evaluation system is examined and an estimate of the costs of using such a system to carry out symbolic program testing is given. An analysis of the circumstances under which symbolic testing is reliable for discovering program bugs is presented. The effectiveness of symbolic testing is compared with other reliability analysis techniques. The analysis of the effectiveness of symbolic testing is based on the study of six programs. GRA

N77-33891# Boeing Computer Services, Inc., Seattle, Wash. Energy Technology Applications Div.

OPTREG: AN INTERACTIVE COMPUTER PROGRAM FOR OPTIMIZATION AND REGRESSION Final Report

Richard A. Erickson, Rosem Southall, David W. Twigg, and Yvonne Y. Wong Jun. 1977 141 p refs
(Contract DOT-HS-356-3-719)
(PB-269480/0; BCS-G0792; DOT-HS-802-422) Avail: NTIS HC A07/MF A01 CSCL 09B

The OPTREG is a computer program which provides stepwise multiple regression analysis and optimization of a user defined function by the geometric simplex method. Both optimization and regression are performed interactively. This gives the user visibility and quick response, as well as a high degree of control over the optimization and regression procedures. The OPTREG is programmed in FORTRAN IV, and operates on the CDC 6600 under the Kronos Interactive Timesharing (KIT) operating system. The OPTREG features are described, examples are given, and KIT control card sets performing the various OPTREG options are provided. GRA

N77-33892# Massachusetts Inst. of Tech., Cambridge. Lab for Computer Science.

AN OVERVIEW OF OWL, A LANGUAGE FOR KNOWLEDGE REPRESENTATION

Peter Szolovits, Lowell B. Hawkinson, and Willima A. Martin Jun. 1977 45 p refs Presented at Workshop on Nat. Language for Interaction with Data Bases held by the Intern. Inst. for Appl. Systems Analysis, Schloss Laxenburg, Austria, Jan. 1977
(Contract N00014-75-C-0661)
(AD-A041372; MIT-LCS-TM-86) Avail: NTIS HC A03/MF A01 CSCL 05/7

The motivation and overall organization of the OWL language for knowledge representation is described. OWL consists of a memory of concepts in terms of which all English phrases and all knowledge of an application domain are represented, a theory of English grammar which tells how to map English phrases into concepts, a parser to perform that mapping for individual sentences, and an interpreter to carry out procedures which are written in the same representational formalism. The system has been applied to the study of interactive dialogs, explanations of its own reasoning, and question answering. GRA

62 COMPUTER SYSTEMS

Includes computer networks.

N77-33893# Stanford Univ., Calif. Digital Systems Lab.
PERFORMANCE ANALYSIS OF COMPUTER COMMUNICATION NETWORKS VIA RANDOM ACCESS CHANNELS
Philip S. Yu Apr. 1977 108 p refs
(Contract DASG60-77-C-0073)
(AD-A041982; SU-SEL-77-021; SU-DSL-TR-137) Avail: NTIS HC A06/MF A01 CSCL 17/2

The field of computer communication networks has grown very rapidly in the past few years. One way to communicate is via multiple access braodcast channels. A new class of random access schemes referred to as the Mp-persistent CSMA scheme is proposed. It incorporates the nonpersistent CSMA scheme and 1-persistent CSMA scheme, both slotted and unslotted versions, as its special cases with p-0 and 1 respectively. The performance of the Mp-persistent CSMA scheme under packet switching in analyzed and compared with other random access schemes. By dynamically adjusting p, the unslotted version can achieve better performance in both throughput and delay than the currently available unslotted CSMA schemes under packet switching. Furthermore, the performance of various random access schemes under message switching is analyzed and compared with that under packet switching. In both slotted and unslotted versions of the Mo-persistent CSMA scheme, the performance under message switching is superior to that under packet switching in the sense that not only the channel capacity is larger but also the average number of retransmissions per successful message under message switching is smaller than that per successful packet under packet switching. Hence, the performance under message switching may be superior to or inferior to that under packet switching depending upon the random access scheme being used and the distribution of message length (usually a large coefficient of variation of message length implies a large degradation of channel capacity in this case) for certain random access schemes. GRA

N77-33894# California Univ., Berkeley. Lawrence Berkeley Lab.
COMPUTER NETWORKS IN THE PHYSICAL SCIENCES
Donald M. Austin 10 Nov. 1976 24 p refs Presented at Conf. on Computer Networks in the Phys. Sci., Boston, 11 Nov. 1976
(Contract W-7405-eng-48)
(LBL-5594; Conf-761159-1) Avail: NTIS HC A02/MF A01

The concept of the computer network is discussed in a nontechnical way. The network allows sharing of very expensive hardware and highly developed software. The capabilities of a distributed network are described with respect to hardware resources, software resources, data bases, and research collaboration. Examples of applications considered include partial wave analysis, track sensitive target experiment data analysis, mathematical software portability, gateways between networks and teleconferencing. ERA

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support*.

N77-33895# Stanford Univ., Calif. Artificial Intelligence Lab.
COMPUTER VISUAL SYSTEMS FOR EXPLORATORY RESEARCH Progress Report
Donald B. Gennery, Hans P. Moravec, and Thomas O. Binford Oct. 1977 6 p
Avail: NTIS HC A03/MF A01

The research on vision and navigation systems for an autonomous Mars roving vehicle is reported. The experiments were carried out on a battery-powered electric vehicle, remotely coupled to a PDP-KL10 time-sharing system. The vision system was based on automated stereo perception. The implementation of the range mapping mechanism is described along with the hardware and software. It is concluded that obstacle avoidance cannot work reliably with this combination of approach and hardware. F.O.S.

N77-33896# BDM Corp., Vienna, Va.
MAINTENANCE FOR THE NET-2 NETWORK ANALYSIS PROGRAM Final Report, 6 Apr. 1976 - 5 Apr. 1977
Allan F. Malmberg Apr. 1977 15 p
(Contract DAAG39-76-C-0086)
(AD-A041074; HDL-086-1) Avail: NTIS HC A02/MF A01 CSCL 05/1

Maintenance activities for the Release 9 version of the NET-2 Network Analysis Program are described. These activities include correction of logical and programming errors, improvement of numerical techniques as required, and provision of engineering assistance and consultation in the application of NET-2 as directed by the Harry Diamond Laboratories. Author (GRA)

N77-33897# Air Force Academy, Colo. Frank J. Seiler Research Lab.
HIGH ANGLE OF ATTACK FLIGHT CONTROL USING STOCHASTIC MODEL REFERENCE ADAPTIVE CONTROL
Robert B. Asher and Dieter Goebel May 1977 106 p refs
(AF Proj. 2304)
(AD-A041436; FJSRL-TR-77-0010) Avail: NTIS HC A06/MF A01 CSCL 19/5

High angle of attack flight control is of utmost importance to military aircraft in air combat maneuvering. Flight in this regime has in recent years caused many high performance aircraft to be lost due to departure of the aircraft. The aerodynamics in this regime are highly nonlinear. The problem is compounded by the fact that the aerodynamics are not well known. This paper considers the use of adaptive control in order to perform model following of an ideal aircraft in the presence of uncertain aerodynamic coefficients. In particular, the partitioning approach of adaptive control is extended to the implicit model following problem. This is then used to solve the problem of high angle of attack flight control. Author (GRA)

N77-33898# Maryland Univ., College Park. Computer Science Center.
A METHOD OF ADAPTIVE SMOOTHING AND EDGE ENHANCEMENT
Durga P. Panda Feb. 1977 47 p refs
(Contract DAAG53-76-C-0138; ARPA Order-3206)
(AD-A041909; TR-504) Avail: NTIS HC A03/MF A01 CSCL 12/1

A local operator, 'SWAC', is introduced which identifies image neighborhoods that are noisy and do not contain any boundary. An adaptive smoothing function, guided by the response of SWAC, successfully smooths noisy regions in images without degrading edges. The response of SWAC is also successfully used as a weighting function to suppress spurious responses of an edge detector operating in a noisy environment. Author (GRA)

N77-33899# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
OBSERVABILITY AND IDENTIFIABILITY OF NONLINEAR DYNAMICAL SYSTEMS WITH AN APPLICATION TO THE OPTIONAL CONTROL MODEL FOR THE HUMAN OPERATOR Ph.D. Thesis
Raymond E. Siferd Jun. 1977 278 p refs
(AD-A041794; AFIT-DS/EE/77-1) Avail: NTIS HC A13/MF A01 CSCL 12/1

Two very important and fundamental topics in the theory of dynamical systems are observability and identifiability. There has been limited work on the observability and identifiability of nonlinear dynamical systems. This problem is addressed by viewing the observation process as a nonlinear mapping of the initial states (and parameters) to the output measurements. The problem of observability and identifiability is then reduced to finding conditions under which the nonlinear mapping is one-to-one. Author (GRA)

N77-33900# Omnemii, Inc., Vienna, Va.
DEVELOPMENT OF A CONTINUOUS PERFORMANCE MEASURE FOR MANUAL CONTROL Final Report
E. M. Connelly, R. M. Zeskind, and G. P. Chubb (AMRL) Wright

Patterson AFB, Ohio AMPL Apr. 1977 167 p refs
(Contract F33615-75-C-5088)
(AD-A041676; AMRL-TR-76-24) Avail: NTIS HC A08/MF A01 CSCL 12/1

The performance measurement concept typically applied to manual control systems employs a summary measure which provides a numerical score to represent performance of the total control problem. While summary measures are necessary for evaluating total performance they do not reveal information about control actions that occur during the control problem. If performance can be measured and evaluated continuously throughout the control problem each control action can be evaluated rapidly and thus individually. Also if the continuous measurement and evaluation can be related to the summary measure, each control action can be evaluated as an entity, as well as, part of the total control problem. The desired continuous performance measure (CPM) provides a continuous indication of the correct motion of the aircraft at each point in a mission segment and what is also important, an indication of the significance of any motion errors with respect to the summary measure performance selected. This application of the continuous performance measure is termed the 'Mission Model' since the model can provide both reference aircraft motion and an evaluation of the flight control errors. The objective of the research reported here is to evaluate the feasibility of continuous performance measures for aircraft systems, and the development of the necessary computational tools. GRA

N77-33901# Texas Univ., Austin. Electronics Research Center.
DYNAMIC SCENE ANALYSIS: THE STUDY OF MOVING IMAGES
W. N. Martin and J. K. Aggrarwal 15 Jan. 1977 91 p refs
(Contract F44620-76-C-0089)
(AD-A042124; AFOSR-77-0722TR; TR-184) Avail: NTIS HC A05/MF A01 CSCL 09/2

Scene analysis has long been a fusion point between the fields of pattern recognition and artificial intelligence. It integrates techniques from both disciplines. Usually, these techniques are applied to single frames containing static images, but recently there has been growing interest in developing techniques which could be applied to scenes containing moving images. This report contains two major parts: the first part is a survey of the computer systems, as reported in the literature, which attempts to analyze scenes containing moving images; the second part is a detailed description of a system to analyze scenes containing moving planar curvilinear objects. GRA

N77-33902# Maryland Univ., College Park. Computer Science Center.
REGION TRACKING USING DYNAMIC PROGRAMMING
David L. Milgram May 1977 18 p refs
(Contract DAAG53-76-C-0138; ARPA Order 3206)
(AD-A041908; TR-539) Avail: NTIS HC A02/MF A01 CSCL 17/8

The objects contained in a sequence of images may be tracked from frame to frame by defining a comparison function which evaluates the difference between descriptions of object regions in adjacent frames. One can then apply dynamic programming to discover the most temporally consistent object region. Removing all descriptions of this region from frame to frame allows dynamic programming to be reapplied iteratively. Author (GRA)

N77-33903# California Univ., Los Angeles. Dept. of Engineering Systems.
ASYMPTOTIC PROPERTIES OF THE DISCRETE MINIMUM VARIANCE OUTPUT FEEDBACK CONTROL Interim Report
Albert B. Chammas and Cornelius T. Leondes 1977 21 p refs
(Grant AF-AFOSR-2958-76)
(AD-A042782; AFOSR-77-0861TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

In this paper the asymptotic behavior of the discrete minimum variance output feedback control law is investigated. It is shown that this control law results in an asymptotically stable closed-loop system. For time invariant systems, the output feedback gain tends to a periodic function of time which is easier to implement in the feedback loop. Author (GRA)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N77-33904 Wisconsin Univ., Madison.
REGULAR MULTIVALUED FUNCTIONS AND ALGORITHMIC APPLICATIONS Ph.D. Thesis
Javier Maguregui 1976 71 p
Avail: Univ. Microfilms Order No. 77-8801

Convex multivalued functions exhibit a certain type of regular behavior when their ranges have internal points. Their properties are applied to develop a perturbation theory for nonlinear differentiable function over convex sets in Banach spaces. A condition which involves the linearization of the function about a point is sufficient and, under a reasonable additional assumption, also necessary for the good behavior, near that point, of the function when it is subjected to small but arbitrary perturbations. Newton's method and the modified Newton's method are extended to such functions, giving convergence results and error bounds for both methods, again using properties of regular convex multivalued function. Dissert. Abstr.

N77-33905 Brown Univ., Providence, R. I.
GENERIC BIFURCATION WITH APPLICATION TO THE VON KARMAN EQUATIONS Ph.D. Thesis
Stephen Edgar List 1976 64 p
Avail: Univ. Microfilms Order No. 77-14157

The possible types of generic bifurcation are examined that can occur for a three-parameter family of mappings from a Banach space into itself. Specifically, the general form of the bifurcation equations arising from the von Karman equations for the buckling of a rectangular plate are investigated. Chow, Hale, and Mallet-Paret studied the bifurcation of solutions to these equations in a two parameter setting. These parameters are related to the normal loading and to the compressive thrust applied at the ends of the plate. A third bufurication parameter is introduced by considering the length of the plate as variable. The generic hypotheses of Chow, et al., no longer apply in this three parameter setting, but modifications and extensions of these hypotheses permit a characterization of the three-parameter bifurcation diagram. The bifurcation sheets of this diagram appear as a natural generalization of the finite collection of arcs comprising the two-parameter diagram. As an example of this theory, an actual three-parameter bifurcation diagram is constructed for a specific form of the von Karman equations. Dissert. Abstr.

N77-33906 Brown Univ., Providence, R. I.
IMMERSION AND EMBEDDING OF PROJECTIVE VARIETIES Ph.D. Thesis
Kent William Johnson 1976 49 p
Avail: Univ. Microfilms Order No. 77-14136

Definitions for immersion and imbedding were extended to include the case where X is a (possibly singular) subvariety of some projective space, Y = IP sup m is a smaller projective space, and f is the set of all projections of X to IP sup m. The definitions guarantee that the ramification and double homology classes calculated have uniform dimension. The classes can be represented by positive cycles whose supports are, respectively, the ramification and double loci of a generic projection of X to IP sup m. The formulas are in terms of homology invariants of X which are Poincare dual to the inverse Chern classes of X when X is nonsingular. Dissert. Abstr.

N77-33907 Adelphi Univ., Garden City, N. Y.
NON-STANDARD PARTIAL DIFFERENCE EQUATIONS Ph.D. Thesis
Elliott Warren Jacobs 1977 104 p
Avail: Univ. Microfilms Order No. 77-14270

The relationship between partial differential equations and partial difference equations is explored from the viewpoint of nonstandard analysis. A nonstandard difference equation is defined as a difference equation solved on a mesh of infinitesimal mesh

width. Nonstandard partial difference equations are intended to be an intermediate stage between partial difference equations and partial differential equations. Nonstandard analysis is used to reformulate the standard problems of stability and convergence and to prove a theorem of Peter Lax that stability and convergence are equivalent for a well-posed initial value problem. Also, the solutions of certain partial differential equations are shown to exist by demonstrating that the standard parts of solutions of nonstandard partial difference equations exist and solve the partial differential equation. A discussion is given of the use of the ultraspectrum of a nonstandard difference operator to detect instability. Dissert. Abstr.

N77-33906 Wisconsin Univ., Madison.
A BOUNDARY VALUE CONTROL PROBLEM FOR HYPERBOLIC SYSTEMS Ph.D. Thesis
Kathy Rou-Sing Chueh 1976 249 p
Avail: Univ. Microfilms Order No. 77-8084

The control theory of linear first order symmetric hyperbolic systems of partial differential equations with boundary value controls was studied to explore the question of finite time controllability and the possibility of expressing the boundary control which steers the system to 0 in the minimal time interval in terms of a linear feedback control law. A hyperbolic system is shown to be exactly controllable in time T if and only if T is greater than or = 2 lambda. There is a control law which steers the system to 0 at T = 2 lambda. The closed loop system thus involves a semigroup S(t) which has the property S(t) = 0, t or = 2 lambda. Dissert. Abstr.

N77-33909 Rensselaer Polytechnic Inst., Troy, N. Y.
NUMERICAL SOLUTION OF A CLASS OF RANDOM BOUNDARY VALUE PROBLEMS Ph.D. Thesis
Marian Ruth Barry 1976 106 p
Avail: Univ. Microfilms Order No. 77-13703

Numerical integration of a set of related deterministic problems was used to construct an approximate probability distribution function of the solution of a random nonlinear two-point boundary value problem. In each of the two methods presented, convergence of the approximate function to the actual probability distribution function is proved. In proving the convergence, the values that the random variables can assume are essentially dealt with as parameters in a deterministic problem and the only restrictions on the differential equation are those that require that the solution be a continuously differentiable function of those parameters. As an example of the methods discussed, a version of the one-dimensional heat equation is solved numerically and the approximate distribution function is computed for one and two random variables. Dissert. Abstr.

N77-33910# Nagoya Univ. (Japan). Inst. of Plasma Physics.
SPACE AND TIME EVOLUTION OF TWO NONLINEARLY COUPLED VARIABLES: SPECIAL SOLUTIONS
H. Obayashi, H. Totsuji (Tokyo Univ., Japan), and H. Wilhelmsson (Chalmers Univ. of Technol.) Dec. 1976 24 p refs
(IPPJ-273) Avail: NTIS HC A02/MF A01

The system of two coupled linear differential equations are studied assuming that the coupling terms are proportional to the product of the dependent variables, representing e.g. intensities or populations. It is furthermore assumed that these variables experience different linear dissipation or growth. The derivations account for space as well as time dependence of the variables. It is found that certain particular solutions can be obtained to this system, whereas as full solution in space and time as an initial value problem is outside the scope of the present paper. The system has a nonlinear equilibrium solution for which the nonlinear coupling terms balance the terms of linear dissipation. The case of space and time evolution of a small perturbation of the nonlinear equilibrium state, given the initial one-dimensional spatial distribution of the perturbation, is also considered in some detail. Author

N77-33911*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Information Systems Div.
RECURRENCE RELATIONS FOR COMPUTING WITH MODIFIED DIVIDED DIFFERENCES
Fred Krogh 15 Sep. 1977 13 p refs
(Contract NAS7-100)
(NASA-CR-155177; JPL-Pub-77-46) Avail: NTIS HC A02/MF A01 CSCL 12A

Modified divided differences (MDD) provide a good way of representing a polynomial passing through points with unequally spaced abcissas. Recurrence relations for computing coefficients in either the monomial or Chebyshev basis from the MDD coefficients, and for computing the MDD coefficients for either the differentiated or the integrated polynomial are given. The latter operation is likely to be useful if MDD are used in a method for solving stiff differential equations. Author

N77-33912# North Carolina Univ., Chapel Hill. Dept. of Statistics.
A STUDY OF POWER TRANSFORMS
Robert A. Fondren May 1977 41 p refs
(Grant AF-AFOSR-2796-75)
(AD-A041985; Mimeo-Ser-1123; AFOSR-77-0712TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

In most practical situations, the data one has do not follow the normal distribution; if the data were normal, one could use all of the procedures of multivariate analysis which apply to normally distributed data. In this paper, a routine method for making the data follow the normal distribution more closely is discussed; this method is to transform the data. Author (GRA)

N77-33913# Naval Underwater Systems Center, New London, Conn.
AN ADDITION FORMULA FOR GREEN'S FUNCTIONS Ph.D. Thesis
Jeffrey S. Cohen and John S. Papadakis 14 Jun. 1977 67 p refs
(AD-A041667; NUSC-TR-5693) Avail: NTIS HC A04/MF A01 CSCL 12/1

A formula yielding an expression for the Green's function of a linear separable elliptic partial differential equation in terms of the Green's function for two simpler equations, one of which is elliptic and the other hyperbolic, is derived utilizing separation of variables, transform techniques for solving ordinary differential equations, Parseval's identity from Fourier transform theory, and general properties of Green's and Riemann functions. The formula is applied successfully to specific problems, some of which are believed to be previously unsolved, and Green's functions are represented using the special functions of mathematical physics. A more detailed overview of the thesis may be found in Appendix A, which is the recommended starting point for reading this thesis. Author (GRA)

N77-33914# California Univ., Riverside. Dept. of Mathematics.
IMPROVED CONVERGENCE FOR LINEAR SYSTEMS USING THREE-PART SPLITTINGS Interim Report
John DePillis 28 Jun. 1977 20 p refs
(Grant AF-AFOSR-2858-75)
(AD-A041729; AFOSR-77-0799TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

It is shown that by changing the weighting factors, the fast Fourier Transform (FET) may be modified to produce a frequency offset. The technique may be used in digital modems to allow a receiver to effectively tune-in to two or more frequencies simultaneously. It may allow improved frequency acquisition in burst transmission systems and improve frequency tracking in conditions where there is rapid rate of change of frequency. Author (GRA)

N77-33915# Temple Univ., Philadelphia, Pa. Dept. of Mathematics.
ON MEASURES OF DEPENDENCE: A SURVEY OF RECENT DEVELOPMENTS Interim Report
S. Kotz and C. Soon May 1977 53 p refs
(Grant AF-AFOSR-2837-75)
(AD-A041814; AFOSR-77-0745TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

The purpose of these notes is to survey the recent literature on dependence between two random variables and to stimulate research which will extend (some of) these concepts and relations to the case of 3 or more variables. Author (GRA)

N77-33916# Syracuse Univ., N. Y. Dept. of Electrical and Computer Engineering.
NEW CAPABILITIES OF WALSH FUNCTIONS AND WALSH TRANSFORMS Interim Report, 1 Apr. 1976 - 31 May 1977
David K. Cheng May 1977 6 p
(Contract AF-AFOSR-2809-75)
(AD-A041748; AFOSR-77-0802TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Research progress has been in four areas: solution of difference equations; sequency ordering of Hadamard functions; generalized orthogonal transformation matrix; and analysis of nonlinear systems. GRA

N77-33917# Purdue Univ., Lafayette, Ind. Dept. of Statistics.
MINIMAX SUBSET SELECTION WITH APPLICATIONS TO UNEQUAL VARIANCE PROBLEMS
Roger L. Berger and Shanti S. Gupta Jul. 1977 22 p refs
(Contract N00014-75-C-0455)
(AD-A041744; Mimeo-Ser-495) Avail: NTIS HC A02/MF A01 CSCL 12/1

Let X(1),...,X(k) be observations from populations whose distributions are determined by unknown real parameters theta(1),..., theta(k). In a subset selection problem, the goal is to select a subset of the populations which includes the population associated with the largest parameter with 'high' probability and includes the other populations with 'low' probability. In this paper, rules are found which are minimax in the class of non-randomized, just, and translation invariant rules when risk is measured by the maximum probability of including a non-best population. These rules are of the form proposed and studied by Gupta in location and scale parameter problems. In many cases, these rules are the unique minimax rule in the class and, hence are also admissible in this class. These results are applied to the normal mean problem with known unequal variances (or unequal sample sizes). A comparison of several proposed rules is made. A rule proposed by Gupta and Huang is found to be minimax. A generalization of the rule, proposed by Gupta and Wong, is likewise minimax. Other rules, proposed by Chen and Dudewicz and Gupta and Huang are shown to be not minimax. GRA

N77-33918# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
ON THE AVERAGE NUMBER OF MAXIMA IN A SET OF VECTORS AND APPLICATIONS Interim Report
J. L. Bentley, H. T. Kung, M. Schkolnick, and C. D. Thompson Jul. 1977 20 p refs
(Contract N00014-76-C-0370; Grant NSF MCS-75-22255)
(AD-A042597) Avail: NTIS HC A02/MF A01 CSCL 12/1

A maximal vector of a set is one which is not less than any other vector in all components. A recurrence relation is derived for computing the average number of maximal vectors in a set of n vectors in d-space under the assumption that all n factorial to the dth power relative orderings are equally probable. Solving recurrence shows that the average number of maxima is O((1n n) to the (d-1)th power). This result is used to construct an algorithm for finding all the maxima that has expected running time linear in n (for sets of vectors drawn under our assumptions). For a given set of random points, the result is also used to derive an upper bound on the expected number of points from the set which are on the boundary on the convex hull of the set. Author (GRA)

N77-33919# Illinois Univ., Urbana-Champaign. Dept. of Computer Science.
GAUSSIAN ELIMINATION AND NUMERICAL INSTABILITY Interim Report
Robert D. Skeel Apr. 1977 67 p refs
(Grant AF-AFOSR-2854-75)
(AD-A042159; UIUCDCS-R-77-862; UILU-ENG-77-1714; AFOSR-77-0801TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

Roundoff error in the solution of linear algebraic systems is studied using a more realistic notion of what it means to perturb a problem, namely that each datum is subject to a relatively small change. The condition number is determined for this approach. A good computable error bound is given for the 'backward error'. The effect of scaling on the stability of Gaussian elimination is studied, and it is discovered that the proper way to scale a system is dependent on knowing the solution. Finally it is shown that Gaussian elimination can be stabilized by doing iterative improvement. Author (GRA)

N77-33920# Rochester Univ., N. Y. Dept. of Statistics.
TESTING SIGNIFICANCE OF A MEAN VECTOR: A POSSIBLE ALTERNATIVE TO HOTELLING'S T SQUARED Interim Report
Govind S. Mudholkar and Perla Subbaiah 1977 20 p refs
(Grant AF-AFOSR-3360-77)
(AD-A042644; AFOSR-77-0856TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

In problems involving multivariate measurements experimental considerations often indicate grouping of variables into subsets ordered according to their importance. In such situations, the problems such as comparison of two mean vectors and profile analysis may be treated by Hotelling's T-square-test, adapted along the lines of the step-wise procedure of J. Roy, or the well known test for additional information due to Rao. In this paper, a modification of the step-wise procedure obtained by combining the component tests is studied. The exact Bahadur slopes of resulting procedures are computed and it is shown that the procedure based upon Fisher's combination method is asymptotically equivalent to Hotelling's T-square. A Monte Carlo study suggests that even in small samples the power functions of the new method and Hotelling's T-square-test are practically equivalent. GRA

N77-33921# Virginia Polytechnic Inst. and State Univ., Blacksburg.
ESTIMATING THE LAG IN A NONLINEAR TIME SERIES MODEL
Melvin J. Hinich Apr. 1977 12 p refs
(Contract N00014-75-C-0494)
(AD-A042451; TR-7) Avail: NTIS HC A02/MF A01 CSCL 12/1

A method is presented for estimating delay, d, which is easy to compute from the discrete Fourier transform of a sample of two stochastic proposes, (x sub t) and (y sub t). The estimator uses statistics which a frequency domain oriented analyst would use in the course of building a linear predictor of y sub t. The estimate of d is a diagnostic tool for an analyst who is skeptical about the linearity of his model. Author

N77-33922# Wisconsin Univ., Madison. Mathematics Research Center.
APRIORI ESTIMATES OF HIGHER ORDER DERIVATIVES OF SOLUTIONS TO THE FITZHUGH-NAGUMO EQUATIONS
M. E. Schonbek Apr. 1977 44 p refs
(Contract DAAG29-75-C-0024; Grant NSF MCS-75-17385)
(AD-A042694; MRC-TSR-1740) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper establishes bounds for the derivatives of all orders of the solutions to the FitzHugh-Nagumo equations. GRA

N77-33923# Naval Ship Research and Development Center, Bethesda, Md. Computation, Mathematics, and Logistics Dept.
CSKYTI: AN OUT-OF-CORE CHOLESKY ALGORITHM EQUATION SOLVER (WITH RESPECT TO PROFILE) FOR THE TEXAS INSTRUMENTS' ADVANCED SCIENTIFIC COMPUTER
Donald A. Gignac Jul. 1977 30 p refs
(SR0140301)
(AD-A042807; DTNSRDC-77-0082) Avail: NTIS HC A03/MF A01 CSCL 12/1

CSKYTI is an out-of-core profile approach Cholesky algorithm equation solver for large sparse positive definite systems of linear equations. CSKYTI is an adaptation of an existing CDC 6000 series program, CSKYDG2, for the Advanced Scientific Computer (ASC 6). The preprocessor program SETUP for CSKYTI was similarly obtained from CSKYDG2's SETUP program. This report documents a comparison of the performance of CSKYTI and its SETUP on the ASC 6 with that of CSKYDG2 and its SETUP on the CDC 6600 at DTNSRDC. It would appear that the ASC 6

requires double precision arithmetic to obtain the significance of single precision computation on the CDC 6600. Even so, the ASC 6 was found to be fast compared to the CDC 6600.
Author (GRA)

N77-33924# IBM Watson Research Center, Yorktown Heights, N.Y.
AN ALGORITHM FOR MINIMIZING A DIFFERENTIABLE FUNCTION SUBJECT TO BOX CONSTRAINTS AND ERRORS Interim Report
R. K. Brayton and Jane Cullum 10 Mar. 1977 57 p refs Presented at SIAM Natl. Meeting, Chicago, 16-18 Jun. 1976
(Contract F44620-76-C-0022)
(AD-A042916; RC-6429; AFOSR-77-0904TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

Consider the problem of minimizing a differentiable function of n parameters with the parameters restricted to a box in n-space. A variable metric algorithm designed for this problem is described. It uses the symmetric rank one update formula, so that no matrix projections at the boundary of the box are necessary; and consequently, a Hessian approximation on the subspace spanned by the directions previously searched is available at each iteration to use in determining which constraints to drop. Moreover, the algorithm is designed to handle problems where the function and its gradient are evaluated with error. The difficulties associated with the symmetric rank one update formula and used to argue against its implementation have seldom been encountered in numerical experience to date and are circumvented. Numerical examples are presented which show: (1) The algorithm presented compares favorably with Fletcher's excellent unconstrained minimization program available from Harwell and (2) On box-constrained problems, the algorithm is reliable and efficient. Problems with and without errors in the function and gradient values were considered. GRA

N77-33925# California Univ., Livermore. Lawrence Livermore Lab.
EPISODE: AN EFFECTIVE PACKAGE FOR THE INTEGRATION OF SYSTEMS OF ORDINARY DIFFERENTIAL EQUATIONS
A. C. Hindmarsh and G. D. Byrne 1977 69 p refs
(Contract W-7405-eng-48)
(UCID-30112-Rev-1) Avail: NTIS HC A04/MF A01

A package of subroutines written in FORTRAN (EPISODE) provides the numerical solution of the initial-value problem for systems of ordinary differential equations. The EPISODE package contains both a variable-step, variable-order implicit Adams method and a variable-step, variable-order backward differentiation method. Since the user may select either of these methods simply by assigning the appropriate value to a method flag, EPISODE can be used to solve either stiff or nonstiff problems. Similarly, the user also selects one of four corrector iteration methods to be used. ERA

N77-33926# California Univ., Livermore. Lawrence Livermore Lab.
AREAL MAPPING OF ARBITRARY PLANE REGIONS ONTO RECTANGULAR MESHES
S. I. Warshaw Mar. 1977 23 p refs
(Contract W-7405-eng-48)
(UCID-17415) Avail: NTIS HC A02/MF A01

A simple and powerful method is presented for calculating all areas of intersection that occur when a plane region of arbitrary shape and connectivity overlaps the cells of a rectangular mesh. This procedure was successfully used in an algorithm for a digital computer, and details are given for a unique procedure which effectively sidesteps floating problems associated with machine noise. A simplifying procedure is also outlined for areal mapping of a collection of complex planar configurations onto a rectangular Eulerian mesh. ERA

N77-33927# Sandia Labs., Albuquerque, N. Mex. Experimental Aerodynamics Div.
COLLECTION OF EQUATIONS FOR LOW-DEGREE LEAST-SQUARES POLYNOMIALS
Edward L. Clark, Jr. Apr. 1977 89 p refs
(Contract EY-76-C-04-0789)
(SAND-76-0648) Avail: NTIS HC A05/MF A01

The least squares normal equations are solved for general functions having one to three coefficients that occur linearly. Expressions are given for evaluating the coefficients of the most useful low-degree least squares polynomials. Simplified equations are derived for smoothing and differentiating data that is equally spaced in the independent variable. It is shown that a least squares polynomial, if fit to an odd number of equally spaced points and evaluated at the midpoint of the fit, acts as a digital filter. Equations for the frequency response of the filter are given and expressions for the filter weights are derived which permit more efficient smoothing than is possible with conventional techniques. ERA

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N77-33928 Brown Univ., Providence, R. I.
STOCHASTIC APPROXIMATION ALGORITHMS FOR THE SEQUENTIAL MONTE CARLO OPTIMIZATION OF STOCHASTIC SYSTEMS Ph.D. Thesis
Milton Luiz Kelmanson 1976 105 p
Avail: Univ. Microfilms Order No. 77-14145

Stochastic approximation versions of methods of feasible directions are discussed, and a stabilization theorem is proven. Stochastic versions of the combined penalty function-multiplier methods (or augmented Lagrangian) for equality and inequality constraints are proposed and convergence proofs are given. These ideas are extended to a continuous time stochastic optimal control problem. A rigorous derivation of the first and second (Frechet) derivatives of the cost functional are presented. The algorithms given are of the small steps type. They have better numerical behavior, in the stochastic case, than those with large or optimal steps. Dissert. Abstr.

N77-33929*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A WEIBULL CHARACTERIZATION FOR TENSILE FRACTURE OF MULTICOMPONENT BRITTLE FIBERS
R. G. Barrows 1977 30 p refs Presented at the Fall Metals Conf., Chicago, 24-27 Oct. 1977; sponsored by the Met. Soc. of the Am. Inst. of Mining, Met., and Petrol. Engr. Prepared in cooperation with US Army Air Mobility R and D Lab., Cleveland
(NASA-TM-73790; E-9357) Avail: NTIS HC A03/MF A01 CSCL 12A

A statistical characterization for multicomponent brittle fibers is presented. The method, which is an extension of usual Weibull distribution procedures, statistically considers the components making up a fiber (e.g., substrate, sheath, and surface) as separate entities and taken together as in a fiber. Tensile data for silicon carbide fiber and for an experimental carbon-boron alloy fiber are evaluated in terms of the proposed multicomponent Weibull characterization. Author

N77-33930# Naval Postgraduate School, Monterey, Calif.
BAYESIAN DECISION THEORY IN VARIABLES SAMPLING FOR QUALITY CONTROL M.S. Thesis
James R. Anderson Jun. 1977 52 p refs
(AD-A042117) Avail: NTIS HC A04/MF A01 CSCL 12/2

The Bayesian decision method has several features which are desirable in the sampling inspection process for quality control. These features include: (1) comparison of the value of sample information in the decision process with the information; (2) basing decisions on their consequences to the decision maker; and (3) allowing the use of subjective information in the decision process. In this paper the Bayesian decision procedures as it applies to variables sampling for quality control is examined. The basic method is developed for both simultaneous and sequential sampling and the modeling of decision consequences is discussed. Various models for the production process are provided and solutions for the generalized linear model obtained. Finally the incorporation of subjective information is discussed.
Author (GRA)

N77-33931# California Univ., Davis. Dept. of Mathematics.
A CHARACTERIZATION OF CONVOLUTED GEOMETRIC DISTRIBUTIONS
Francisco J. Samaniego May 1977 14 p refs
(Grant AF-AFOSR-3180-77)
(AD-A042136; AFOSR-77-0803TR; TR-1) Avail: NTIS HC A02/MF A01 CSCL 12/1

Let X be a nonnegative integer-valued random variable whose distribution is that of the sum of geometric variable Y with parameter theta and a nonnegative integer-valued random variable Z independent of Y whose distribution does not depend on theta. The class of all such distributions are characterized by a system of differential equations satisfied by their probability mass functions. The characterization is shown to be useful in maximum likelihood estimation of the parameter theta when the distribution of Z is known. GRA

N77-33932# California Univ., Berkeley. Operations Research Center.
AVERAGE DELAY IN QUEUES WITH NONSTATIONARY POISSON ARRIVALS
Sheldon M. Ross May 1977 18 p refs
(Contract N00014-77-C-0299)
(AD-A041629; ORC-77-13) Avail: NTIS HC A02/MF A01 CSCL 12/2

Single server infinite capacity queueing models are considered in which the arrival process is a nonstationary process with an intensity function t > or = 0, which is itself a random process. The average value of the intensity function exists and is equal to some constant, called lambda, qith, with probability 1. If the effect that the closer [LAMBDA (t), t > or = 0] is to the stationary Poisson process with rate lambda then the smaller is the average customer delay, and then the conjecture is verified in a special case. GRA

N77-33933# Purdue Univ., Lafayette, Ind. Dept. of Statistics.
ON SLIPPAGE TESTS AND MULTIPLE DECISION (SELECTION AND RANKING) PROCEDURES
Ashok K. Sing Jun. 1977 135 p refs
(Contract N00014-75-C-0455)
(AD-A041746; Mimeo-Ser-494) Avail: NTIS HC A07/MF A01 CSCL 12/1

Suppose k independent populations are given and we are interested in t (1 < or = t < or = k) of these populations which are better than the rest. Two different formulations, namely testing t slippages, and selection of a subset (of a random size or a fixed size t) containing the t better populations, are considered herein. Both of these formulations provide answers to certain relevant questions which are not answered by the classical tests of homogeneity. GRA

N77-33934# North Carolina Univ., Chapel Hill. Dept. of Statistics.
ON THE RECONSTRUCTION OF THE COVARIANCE OF STATIONARY GAUSSIAN PROCESSES OBSERVED THROUGH ZERO MEMORY NONLINEARITIES Interim Report
Stamatis Cambanis and Elias Masry (Calif. Univ., La Jolla) 1977 42 p refs
(Contract N00014-75-C-0652; Grant AF-AFOSR-2796-75)
(AD-A041812; AFOSR-77-0729TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

This document considers the problem of reconstructing the normalized covariance function R(t) of a zero mean stationary Gaussian process observed through a zero memory non-linearity f(x), when the nonlinearity and the correlation function or the second order distribution of the output process is known. Three kinds of results are established showing: (1) how arbitrary covariances may be reconstructed for certain nonlinearities: included here are monotonic f's, appropriate interval windows and certain quite general f's; (2) how certain covariances can be reconstructed for arbitrary nonlinearities: included here are positive covariances (< or = 0), covariances with rational spectral densities, and bandlimited covariances; and (3) how certain covariances can be reconstructed for certain nonlinearities: included here are covariances satisfying certain rather weak conditions, which are easily checked in terms of the output correlation function, and certain symmetric as well as nonsymmetric f's. GRA

N77-33935# Florida State Univ., Tallahassee. Dept. of Statistics.
ON DIFFERENTIALS, ASYMPTOTIC NORMALITY AND ALMOST SURE BEHAVIOR OF STATISTICAL FUNCTIONS, WITH APPLICATION TO M-STATISTICS FOR LOCATION PARAMETERS
Dennis D. Boos and R. S. Serfling May 1977 70 p refs
(Contract N00014-76-C-0608)
(AD-A042661; FSU-Statistics-M415; ONR-TR-115) Avail: NTIS HC A04/MF A01 CSCL 12/1

Parameters of interest in statistics can often be expressed as functionals T(F) of the underlying population distribution function, in which case a natural sample analogue estimator is provided by the statistical function T(F sub n) based upon the sample distribution function F sub N. Several notions of differentiability of functionals T are formulated, including innovations designed to broaden the scope of statistical application. Methodology for finding the differential, and for utilizing it to characterize the asymptotic distribution and almost sure behavior of statistical functions, is presented. Typically this means asymptotic normality and the law of the iterated logarithm. GRA

N77-33936# Florida State Univ., Tallahassee. Dept. of Statistics.
A DIFFERENTIAL FOR L-STATISTICS
Dennis D. Boos Jun. 1977 41 p refs
(Contract N00014-76-C-0608)
(AD-A042683; FSU-Statistics-M416; ONR-TR-116) Avail: NTIS HC A03/MF A01 CSCL 12/1

The asymptotic normality result is competitive with one closely related statistic S sub n = Sum from i = (1 to n) of (c wiggle sub in)(X sub in) obtained under stronger conditions on J but a slightly milder condition on F. However, in addition to asymptotic normality of T(F sub n), the differential approach of the present paper yields characterization of the almost sure behavior of T(F sub n) and lends itself to straightforward extension to the case of dependent variables. GRA

N77-33937# Florida State Univ., Tallahassee. Dept. of Statistics.
AN ANNOTATED BIBLIOGRAPHY OF SELECTED REFERENCES ON MAXIMAL INEQUALITIES AND THEIR APPLICATIONS
Mike Longnecker and R. J. Sterfling Aug. 1976 40 p refs
(Contract N00014-76-C-0608)
(AD-A042681; FSU-Statistics-M383; ONR-TR-109) Avail: NTIS HC A03/MF A01 CSCL 12/1

This report provides an annotated bibliography of selected papers, new and old, which we regard as useful to current inquiry into maximal inequalities and their applications. Maximal inequalities are inequalities placing upper bounds on either the moments or the exceedance probabilities relative to the maximum consecutive sum from 1 to k of x sub i, 1 < or = k < or = n, over a sequence of random variables X sub 1...X sub n. The bibliography of papers is prefaced by a brief introduction to maximal inequalties and their applications. Various classical results are cited. GRA

N77-33938# Virginia Polytechnic Inst. and State Univ., Blacksburg.
MEASURING NON-STATIONARITY IN THE PARAMETERS OF A LINEAR MODEL WITH APPLICATIONS TO ASSET RETURNS
Melvin J. Hinich and Richard Roll Jun. 1977 76 p refs
(Contract N00014-75-C-0494)
(AD-A042137; Rept-4) Avail: NTIS HC A05/MF A01 CSCL 12/2

The purpose of this paper is to introduce a technique for measuring non-stationarity in linear models. The technique is conceptually simple. It can be adapted easily to a wide variety of problems and improved upon in obvious ways (which we will mention). Its restriction to linearity is probably not important to the practitioner because the overwhelming majority of commonly used techniques are linear; Examples: the sample mean, regression, analysis of variance. The method produces a time

path of a linear model's coefficients and it provides the capability to assess the statistical significance of the non-stationarity. Furthermore, this is done under very weak assumptions concerning the probability distribution that generated the data. No particular generating process need be assumed. Such a robust method will clearly not be optimal for every application. An investigator who knows the generating process, or is willing to assume that he knows it, will be able to find a specialized technique better adapted to his case; but for those with a lower degree of skill or of arrogance, the method to be described here has much practical value. GRA

N77-33939# Naval Electronic Systems Command, Washington, D. C.

AN INTRODUCTION TO THE THEORY OF LINEAR SYSTEMS

R. Fratila 1977 207 p refs

(AD-A042690) Avail: NTIS MF A01; SOD HC $1.60 CSCL 12/1

Until the past decade the term 'system' as used in the many disciplines of science and engineering conveyed a variety of meaning. Since the early 1960's theorists have been folding these varied impressions into the single, formidable conceptual framework of linear system theory. The discussions of this volume are intended to lend to this unification. Specifically, the intent is to draw on the conceptual ideas that are common to linear filters, linear time-invariant systems, Markov chains and quantum theory and present, in a non-rigorous manner, their respective similarities. GRA

N77-33940# George Washington Univ., Washington, D. C. Program in Logistics.

DETECTING THE SHIFT IN THE PROBABILITY OF SUCCESS IN A SERIES OF BERNOULLI TRAILS

S. Zacks and Z. Barzily 23 Jun. 1977 24 p refs

(Contract N00014-75-C-0729)

(AD-A042739; Serial-T-356) Avail: NTIS HC A02/MF A01 CSCL 12/1

The determination of a stopping rule for the detection of the time of an increase in the success probability of a sequence of independent Bernoulli trials is discussed. Both success probabilities are assumed unknown. A Bayesian approach is applied; the distribution of the location of the shift in the success probability is assumed geometric and the success probabilities are assumed to have a known joint prior distribution. The costs involved are penalties for late or early stoppings. The nature of the optimal dynamic programming solution is discussed and a procedure for obtaining a suboptimal stopping rule is determined. The results indicate that the detection procedure is quite effective. Author (GRA)

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N77-33941*# Virginia Univ., Charlottesville. Dept. of Applied Mathematics and Computer Science.

ERROR BEHAVIOR OF MULTISTEP METHODS APPLIED TO UNSTABLE DIFFERENTIAL SYSTEMS

R. Leonard Brown 1977 16 p refs

(Grant NsG-1335)

(NASA-CR-155169) Avail: NTIS HC A02/MF A01 CSCL 12B

The problem of modeling a dynamic system described by a system of ordinary differential equations which has unstable components for limited periods of time is discussed. It is shown that the global error in a multistep numerical method is the solution to a difference equation initial value problem, and the approximate solution is given for several popular multistep integration formulas. Inspection of the solution leads to the formulation of four criteria for integrators appropriate to unstable problems. A sample problem is solved numerically using three popular formulas and two different stepsizes to illustrate the appropriateness of the criteria. Author

N77-33942# California Univ., Berkeley. Operations Research Center.

A HETEROGENEOUS ARRIVAL AND SERVICE QUEUEING LOSS MODEL

Simon Ford and Sheldon M. Ross May 1977 15 p refs

(Contract N00014-77-C-0299; Grant AF-AFOSR-3213-77)

(AD-A041883; ORC-77-12) Avail: NTIS HC A02/MF A01 CSCL 12/2

It can be shown that if all arrivals finding the server busy are lost then the percentage of arrivals lost is a decreasing function of c. This is in line with a general conjecture to the effect that the more nonstationary a Poisson arrival process is then the greater the average customer delay (in infinite capacity models) or the greater the percentage of lost customers (in finite capacity models). GRA

N77-33943# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Mathematics and Statistics.

MARKOVIAN QUEUEING SYSTEMS WITH STOCHASTICALLY VARYING ARRIVAL RATES

Micha Yadin 15 Jun. 1977 16 p refs

(Contract N00014-75-C-0529)

(AD-A041969; TR-29) Avail: NTIS HC A02/MF A01 CSCL 12/2

Queueing systems which are represented by birth and death processes with time dependent birth intensities and state dependent death intensities are studied. Birth intensities are described by a Markov jump processes. Explicit results are obtained for the M/M/1 model. Author (GRA)

N77-33944# Syracuse Univ., N. Y. Dept. of Industrial Engineering and Operational Research.

OPTIMAL CONTROL OF BIRTH AND DEATH PROCESSES AND QUEUES Interim Report

Richard F. Serfozo 1977 16 p refs

(Grant AF-AFOSR-2627-74)

(AD-A042123; AFOSR-77-0805TR) Avail: NTIS HC A02/MF A01 CSCL 12/2

We consider a controlled birth and death process that moves as follows. Upon reaching a state i a pair of birth-death parameters (lambda, mu), is selected from a prescribed set. Then the process remains in the state i until a birth or death occurs according to these parameters, at which time a pair of birth-death parameters is again selected. This is repeated indefinitely. A cost of c(lambda, mu) - h(i) per unit time is incurred for selecting (lambda, mu) when the process is in state i, and a reward is received for each birth. A policy is a rule for successively selecting the birth-death parameters as a function of the state of the process. GRA

N77-33945# Stanford Univ., Calif. Electronics Labs.

PASSAGE TIME DISTRIBUTION FOR A CLASS OF QUEUEING NETWORKS: CLOSED, OPEN, OR MIXED, WITH DIFFERENT CLASSES OF CUSTOMERS WITH APPLICATIONS TO COMPUTER SYSTEM MODELING

Philip S. Yu Mar. 1977 80 p refs

(Contract DASG60-77-C-0073)

(AD-A042723; SU-SEL-77-017; DSL-TR-135) Avail: NTIS HC A05/MF A01 CSCL 12/1

Networks of queues are important models of multiprogrammed time-shared computer systems and computer communication networks. Although equilibrium state probabilities of a broad class of network models have been derived in the past, analytic or approximate solutions for response time distributions or more general passage time distribution are still open problems. In this paper the passage time problem is formulated as a 'hitting time' or 'first passage time' problem in a Markov system and derive the analytic solution to passage time distributions of closed queueing networks. Efficient numerical approximation is also proposed. The result for closed queueing networks is further extended to obtain approximate passage time distributions for open queueing networks. Finally, we employ the techniques derived in this paper to study the interfault time and response time distribution and density functions of multiprogrammed computer systems. The effects of program behavior, degree of multiprogramming, size of main memory, service time of paging devices and rate of file I/O requests on the shape of distribution functions and density functions have been examined. GRA

N77-33946# Stanford Univ., Calif. Dept. of Computer Science.
A REVIEW OF KNOWLEDGE BASED PROBLEM SOLVING AS A BASIS FOR A GENETICS EXPERIMENT DESIGNING SYSTEM
Mark J. Stefik and Nancy Martin Mar. 1977 95 p refs
(Contract DAHC15-73-C-0435; Grants NSF MCS-76-11649; NSF MCS-76-11935; NIH-RR-00785)
(AD-A042720; SU-STAN-CS-77-596; HPP-77-5) Avail: NTIS HC A05/MF A01 CSCL 12/2

It is generally accepted that problem solving systems require a wealth of domain specific knowledge for effective performance in complex domains. This report takes the view that all domain specific knowledge should be expressed in a knowledge base. With this in mind, the ideas and techniques from problem solving and knowledge base research are reviewed and outstanding problems are identified. Finally, a task domain is characterized in terms of objects, actions, and control/strategy knowledge and suggestions are made for creating a uniform knowledge base management system to be used for knowledge acquisition, problem solving, and explanation. Author (GRA)

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N77-33947 Southwestern Louisiana Univ., Lafayette.
PERIODIC RINGS Ph.D. Thesis
Reyadh Rashid Khazal 1976 102 p
Avail: Univ. Microfilms Order No. 77-13174

Syntactic as well as semantic properties and the structure of periodic rings were developed. A periodic ring is a ring in which every element generates a finite multiplicative semigroup. A ring is periodic if and only if every element generates a subring that is the extension of a nilpotent ring by a finite ring. The Jacobson radical of a periodic ring is nil. Any primitive periodic ring is a ring of algebraic linear tranformations of a vector space over a Galois field. Necessary and sufficient conditions for a linear transformation on an infinite dimensional vector space to be algebraic were found. The class of all periodic rings is closed under forming subrings, homomorphic images, and direct limits. Dissert. Abstr.

N77-33948 Nebraska Univ., Lincoln.
ARITHMETICAL SEMIGROUP RINGS Ph.D. Thesis
Bonnie Rae Reinhardt Hardy 1976 83 p
Avail: Univ. Microfilms Order No. 77-14565

A theorem was developed which provides necessary and sufficient conditions for a semigroup ring of a (not necessarily torsion-free) cancellative semigroup S to be arithmetical. For semigroup rings of torsion-free semigroups the classes of arithmetical rings, Pruefer rings, and Bezoul rings are equivalent. These classes are distinct when the semigroup is not required to be torsion-free. The semigroup rings of cancellative semigroups that are ZPI-rings or principal ideal rings were classified. These concepts are equivalent for semigroup rings of torsion-free semigroups; this is not true for more general semigroup rings. Reduced semigroup rings are characterized. Neccessary and sufficient conditions are given for semigroup rings of several types of not necessarily cancellative semigroups to be reduced. The complexity of the problem of determining all reduced arithmetical rings when the semigroup is not required to be cancellative is discussed. Dissert. Abstr.

N77-33949 Georgia Inst. of Tech., Atlanta.
RESULTS IN SEMI-INNER-PRODUCT SPACES AND GENERALIZED COSINE OPERATOR FUNCTIONS Ph.D. Thesis
Gary Doyle Faulkner 1977 54 p
Avail: Univ. Microfilms Order No. 77-14254

Applications of semiinner-products to geometric properties of Banach spaces are discussed. The relationship between James' notion of orthogonality and the natural orthoganality engendered by a semi-inner-product was investigated and the results applied to models of scalar operators. Theorems characterizing generalized cosine operator functions in Hilbert spaces were developed. A generalized cosine operator function is a family of operators which is realized as the compression of a cosine operator family. The scalar version of these results give a solution of the cosine moment problem. Dissert. Abstr.

N77-33950 Illinois Univ., Urbana-Champaign.
DECISION PROBLEMS IN THE FUNDAMENTAL GROUPS OF 3-MANIFOLDS Ph.D. Thesis
Mark Jerome Dugopolski 1977 62 p
Avail: Univ. Microfilms Order No. 77-14944

Waldhausen gave an algorithm for determining if a loop in a certain type of 3-manifold bounds a singular disk. This algorithm, however, is extremely difficult to apply. Using an algorithm of Haken, a hierachy of surfaces must be found for the 3-manifold which splits it into balls. To do this, non-negative, integral solutions to a rather large system of equations must be found. A simpler version of Waldhausen's algorithm is presented in a more restrictive class of manifolds. It is then shown that in the complementary spaces of alternating knots, the surfaces required for the algorithm are readily available. This solves the word problem for alternating knots in a way that appears to be very natural. The same technique can also be applied to a large class of alternating links. Dissert. Abstr.

N77-33951 California Univ., San Diego.
FINITENESS OF SIMPLICIAL FUNCTION SPACES Ph.D. Thesis
Thomas Trabue Bailey 1977 52 p
Avail: Univ. Microfilms Order No. 77-13679

It is proven that if there is a monomorphism from the simplicial set Y to some standard simplex delta sub p, and if X is a finite simplicial set, then the simplicial function space Y(X) is also finite. General but elementary theory reduces this to proving that the simplicial function space delta sub p (delta sub m) is finite for each non-negative integer m. For a finite set S, let # S be the number of members in S. Then #X(n) counts the simplexes in X(n); thus, #X is a sequence of non-negative integers. A counting formula developed shows that X is finite if and only if #X is bounded by some polynomial. The proof is then completed by combinatorially constructing a polynomial. The proof is then completed by combinatorially constructing a polynomial to bound #delta sub p (delta sub m). Finally, a counter-example is constructed to show the restriction on Y is needed. Dissert. Abstr.

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N77-33952# National Bureau of Standards, Boulder, Colo. Time and Frequency Div.
TIME AND FREQUENCY USER'S MANUAL Final Report
George Kamas, ed. May 1977 221 p
(PB-269220/0; NBS-TN-695) Avail: NTIS HC A10/MF A01 CSCL 14B

A brief history of time and frequency is related, discussing the roles of the National Bureau of Standards and the U.S. Naval Observatory, and explaining how time and frequency are internationally coordinated. The report also explains what time and frequency services are available and how to use them. It discusses the accuracy that can be achieved using the different services as well as the pros and cons of using various calibration methods. GRA

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N77-33953 Wisconsin Univ., Madison.
RECOVERY OF MIDDLE COMPONENTS OF HUMAN AUDITORY AVERAGED ELECTROENCEPHALIC RESPONSE Ph.D. Thesis

Michael Clark Vivion 1976 227 p
Avail: Univ. Microfilms Order No. 77-8123

A method was developed for recovering the middle components (8 to 80 msec) of the human auditory averaged electroencephalic response using monotically presented clicks in a pair-single stimulus paradigm. The recovery of the middle component is described as a function of the intrapair or delta interval. Statistical analysis indicated that amplitude of responses to the second click varied as a function of the delta interval while those of the unpaired click were not significantly affected. Findings indicated that for the middle components, intervals required for full recovery are slightly longer than those for the early (brainstem) components and substantially shorter than those for the late components. Methodologic implications of the findings for threshold electroencephalic audiometry and for other tests of the temporal functioning of the auditory system are reviewed. Possible relations between middle component recovery processes and the sources of these components are discussed. Dissert. Abstr.

N77-33954 Columbia Univ., New York.
THE EFFECT OF PSYCHOPHYSICAL METHOD ON THE LOUDNESS OF CONTINUOUS AND INTERRUPTED PURE TONES Ph.D. Thesis
Dennis Clark Hampton 1977 152 p
Avail: Univ. Microfilms Order No. 77-14809

Using the Bekesy tracking method for such suprathreshold loudness judgement tasks as most comfortable loudness and recalled loudness measurements, normal listeners have tracked C tones at lesser intensities than I tones. The resulting continuous/interrupted (C/I) separations have ranged up to 22 db. Although several variables which contribute to this effect have been identified, explanations of the C/I separation have not been in agreement. A variety of psychophysical methods are used to determine loudness of C and I tones. Results demonstrate that the C/I separations obtained during suprathreshold Bekesy tracking tasks are largely caused by the measurements method rather than by differences in C and I tone loudness.
Dissert. Abstr.

N77-33955 California Univ., San Diego.
RECIPROCAL ACOUSTIC TRANSMISSION IN A MID-OCEAN ENVIRONMENT Ph.D. Thesis
Peter Francis Worcester 1977 80 p
Avail: Univ. Microfilms Order No. 77-13698

The role played in mid-ocean acoustic propagation by currents and current shear was investigated by the simultaneous transmission of pulses in opposing directions between two points. Phase-reversal pulse compression codes centered at 2250 Hz were transmitted by sources at about one kilometer depth and 25 kilometer separation suspended from surface ships. Differences in pulse shapes and amplitudes between simultaneous reciprocal transmission were measured and found to be of the same order as the fluctuations in time of one-way transmissions; therefore, current effects on acoustic propagation in the ocean are significant. Dissert. Abstr.

N77-33956*# Kanner (Leo) Associates, Redwood City, Calif.
METHODS FOR THE ELECTRONIC SIMULATION OF FLIGHT SOUNDS
K. Hillman and K.-P. Gaertner Washington NASA Sep. 1977 19 p refs Transl. into ENGLISH from Z. Flugwiss. (West Ger.), v. 23, no. 6, 1975 p 203-209 Original language document was announced as A75-36993
(Contract NASw-2790)
(NASA-TT-F-17432) Avail: NTIS HC A02/MF A01 CSCL 20A

The most common methods for the electronic synthesis of vehicle sounds are briefly described and their respective advantages are discussed. The realism of sound simulation is determined essentially by the amount of hardware used and the computer capacity available. In aircraft simulators, sound simulation can be particularly costly. However, the flight simulator described herein shows that an inexpensive and adequate aircraft sound simulator can be designed using traditional analog techniques. The synthesis and mixing of the component sounds for take-off, distance flight and landing are discussed. Author

N77-33957*# Kansas Univ. Center for Research, Inc., Lawrence.
A RESEARCH PROGRAM TO REDUCE INTERIOR NOISE IN GENERAL AVIATION AIRPLANES. DESIGN OF AN ACOUSTIC PANEL TEST FACILITY Progress Report
Jan Roskam, Vincent U. Muirhead, Howard W. Smith, and Terry D. Henderson Aug. 1977 102 p refs
(Grant NsG-1301)
(NASA-CR-155152; KU-FRL-317-3) Avail: NTIS HC A06/MF A01 CSCL 20A

The design, construction, and costs of a test facility for determining the sound transmission loss characteristics of various panels and panel treatments are described. The pressurization system and electronic equipment used in experimental testing are discussed as well as the reliability of the facility and the data gathered. Tests results are compared to pertinent acoustical theories for panel behavior and minor anomalies in the data are examined. A method for predicting panel behavior in the stiffness region is also presented. Author

N77-33958*# Kansas Univ. Center for Research, Inc., Lawrence.
A RESEARCH TO REDUCE INTERIOR NOISE IN GENERAL AVIATION AIRPLANES. GENERAL AVIATION INTERIOR NOISE STUDY Progress Report
Jan Roskam, Vincent U. Muirhead, Howard W. Smith, and Tonnis D. Peschier Aug. 1977 159 p refs
(Contract NsG-1301)
(NASA-CR-155153; KU-FRL-317-4) Avail: NTIS HC A08/MF A01 CSCL 20A

The construction, calibration, and properties of a facility for measuring sound transmission through aircraft type panels are described along with the theoretical and empirical methods used. Topics discussed include typical noise source, sound transmission path, and acoustic cabin properties and their effect on interior noise. Experimental results show an average sound transmission loss in the mass controlled frequency region comparable to theoretical predictions. The results also verify that transmission losses in the stiffness controlled region directly depend on the fundamental frequency of the panel. Experimental and theoretical results indicate that increases in this frequency, and consequently in transmission loss, can be achieved by applying pressure differentials across the specimen. Author

N77-33959*# Kansas Univ. Center for Research, Inc., Lawrence.
A RESEARCH PROGRAM TO REDUCE INTERIOR NOISE IN GENERAL AVIATION AIRPLANES Progress Report
Jan Roskam, Vincent U. Muirhead, Howard W. Smith, Tonnis D. Peschier, Don Durenberger, Kees Vandam, and Tzy-Chuan Shu Oct. 1977 76 p refs
(Grant NsG-1301)
(NASA-CR-155154; KU-FRL-317-5) Avail: NTIS HC A05/MF A01 CSCL 20A

Analytical and semi-empirical methods for determining the transmission of sound through isolated panels and predicting panel transmission loss are described. Test results presented include the influence of plate stiffness and mass and the effects of pressurization and vibration damping materials on sound transmission characteristics. Measured and predicted results are presented in tables and graphs. Author

N77-33960*# General Electric Co., Evendale, Ohio. Aircraft Engine Group.
ANALYTICAL AND EXPERIMENTAL STUDIES OF ACOUSTIC PERFORMANCE OF SEGMENTED LINERS IN A COMPRESSOR INLET Final Report
R. E. Motsinger, R. E. Kraft, J. E. Paas, and B. M. Gahn Washington NASA Sep. 1977 147 p refs
(Contract NAS1-13416)
(NASA-CR-2882; R77AEG377) Avail: NTIS HC A07/MF A01 CSCL 20A

The performance of axially segmented (phased) acoustic treatment liners in the inlet of a compressor was investigated. Topics discussed include: (1) the validation of a theoretical procedure to predict propagation and suppression characteristics of duct liners; (2) the in-duct measurement of spinning modes; (3) investigation of phased treatment designs; (4) high Mach inlet acoustic tests; and (5) an experimental investigation of inlet turbulence. The analytical prediction for the multi-segmented treatment was found to provide the correct order of magnitude

of suppression and was generally within 50% of that determined experimentally. Refinements required to improve the correlation are identified. Suppression due to high subsonic Mach number flow effects was found to become significant above an average throat Mach number of 0.65 to 0.7 and 20 PNdB was achieved with an average throat Mach number in the range of 0.80 to 0.85. For the measured turbulence in the inlet, including the axial and circumferential turbulence intensities and the axial integral length scale, data are presented with and without an inlet screen showing that the screen reduced the turbulence intensities and that the BPF noise was reduced as a consequence. Author

N77-33961# Army Aeromedical Research Lab., Fort Rucker, Ala. Bioacoustics Div.

FREQUENCY DEPENDENCE OF IMPULSE NOISE ATTENUATION

James H. Patterson, Jr., Ben T. Mozo, and Robert T. Camp, Jr. Jun. 1977 19 p refs

(AD-A042031; USAARL-77-15) Avail: NTIS HC A02/MF A01 CSCL 06/6

Attempts have been made to use a single auditory value of attenuation to assess the hazard to hearing from exposure to high intensity impulse noise and to establish maximum allowable impulse noise exposure levels. This procedure ignores the interaction of the attenuation characteristics of the hearing protector and the energy density spectrum of the impulse. This report demonstrated that errors as large as 17 dB can result from failing to account for this interaction. Author (GRA)

N77-33962# Technical Univ. of Norway, Trondheim. Akustisk Lab.

NEED FOR NOISE STANDARDS

T. Gjestland May 1975 15 p In NORWEGIAN; ENGLISH summary

(ELAB-STF44-A75044; ISBN-82-595-0624-6) Avail: NTIS HC A02/MF A01; Tech. Univ. of Norway, Trondheim Nor. Kr. 30

The need for common standards in the field of noise measurements is discussed. Such common standards will be adopted as Scandinavian standards. All relevant 150 recommendations and standards are recommended for Scandinavia. The new standards are specifically of interest to noise emission measurement and to the effect of noise screens. ESA

N77-33963# National Inst. for Occupational Safety and Health, Morgantown, W. Va. Testing and Certification Branch.

INDUSTRIAL SOUND LEVEL METER INTERNAL NOISE IN OCTAVE BANDS TEST

Robert J. Koshut 1977 19 p refs

(PB-268952/9; NIOSH/TC/P-012) Avail: NTIS HC A02/MF A01 CSCL 14B

A test procedure was designed to measure internal noise in octave bands of industrial sound level meters which are supplied with AC output connections. The equipment needed to perform the test is listed. GRA

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N77-33964 New York Univ., N. Y.

INVESTIGATIONS ON APPROXIMATE QUANTUM MECHANICAL WAVE FUNCTIONS FOR FIRST PERIOD ATOMS AND MOLECULES Ph.D. Thesis

Alan Tchernoff 1977 201 p

Avail: Univ. Microfilms Order No. 77-13672

An extensive examination of several well known H, He, and H2(+) approximate ground state wavefunctions, phi, and the energy expectation value, E, and residual error expressions is presented. Our examination surprisingly reveals that the contribution of the continuum states in phi to the energy and residual error far exceeds that of the discrete states, excluding the ground state eigenfunction u sub o, to these quantities for these approximate wavefunctions. The fact that the E expression is incapable of handling a non-negligible amount of higher energy discrete and continuum states is also pointed out. A very simple and useful, but non-rigorous, lower bound formula for the ground state overlap integral S = (phi/u sub o) is developed. Finally, an expression for calculating energies which employs two different approximate wavefunctions is proposed and examined in detail. Dissert. Abstr.

N77-33965# Illinois Univ., Urbana-Champaign. Dept. of Chemistry.

STUDY OF RATE OF NONEQUILIBRIUM DECOMPOSITION OF ENERGETIC MOLECULES Final Report, 1972 - 1975

R. A. Marcus May 1977 11 p

(Contract DAAA21-72-C-0679)

(AD-A040162) Avail: NTIS HC A02/MF A01 CSCL 07/4

The research accomplished during this research project is summarized. A statistical-dynamical method for treating the energy distribution of products of unimolecular decompositions was devised. Molecular beam reactions proceeding via long-lived complexes were treated. A numerical quantum mechanical description of simple molecules (three degrees of freedom) decomposing to products was developed. A practical semiclassical method for treating bound state problems and calculating their eigenvalues was formulated. In this way (and for the first time) it became possible to treat semiclassically dynamically nonseparable systems with smoothly varying potentials. The method involves using classical trajectories to obtain topologically independent phase integrals. Imposition of the Born-Sommerfeld quantization rules for these nonseparable systems yields the eigenvalues. Several investigations were undertaken on quantum mechanical treatment of decomposing small molecules (compound state resonances), on use of reduced-size basis sets for treating numerically the quantum mechanics of bimolecular collisions, and on collisional vibrational excitation. Author (GRA)

N77-33966# University of Southern Calif., Los Angeles. Dept. of Chemistry.

REVERSIBLE INTERMOLECULAR ENERGY TRANSFER BETWEEN CHROMIUM (3) COMPLEXES IN FLUID SOLUTION

N. A. P. Kane-Maguire (Furman Univ., Greenville, S.C.), C. G. Toney (Furman Univ., Greenville, S. C.), B. Swiger (Furman Univ., Greenville, S.C.), Arthur W. Adamson, and R. E. Wright Feb. 1977 11 p

(Contract N00014-76-C-0548)

(AD-A040661) Avail: NTIS HC A02/MF A01 CSCL 07/4

Excitation energy transfer from Cr(en)3(3-), Cr(NH3)5(NCS)(2-), trans-CR(en)2(NCS)2(-), and cis-Cr(en)2(NCS)2(-) to Cr(CN)6(3-) is observed in room temperature solutions in water, dimethylsulfoxide, or dimethylformamide. The processes were observed by emission intensity measurements and, especially, by lifetime measurements on both the donor and the acceptor emission. The rate of energy transfer is essentially diffusion controlled in all cases and thus not very sensitive to the charge or ligation of the donor. In addition, evidence for reverse excitation energy transfer is presented; the lifetime of Cr(CN)6(3-) emission is dependent on the concentration of the Cr(III) ammine. It is shown that in this type of coupled system a full kinetic analysis is required to obtain correct bimolecular energy transfer rate constants as those obtained from conventional Stern-Volmer plots can be seriously in error. Author (GRA)

N77-33967# California Univ., San Diego. Dept. of Physics.

OSCILLATORY INDIRECT INTERACTION BETWEEN ADSORBED ATOMS Final Report, 31 Oct. 1976 - 1 Nov. 1977

K. H. Lau and Walter Kohn Jul. 1977 36 p refs

(Contract N00014-76-C-0050)

(AD-A042376; TR-40) Avail: NTIS HC A03/MF A01 CSCL 20/12

The oscillatory part of the indirect interaction between two adatoms on a metal surface, separated by a large distance R, is examined for the jellium as well as for the tight-binding model. The asymptotic form of the interaction is derived from the singularity of its Fourier transfer at wave number of q = 2k F sub. For a substrate with a spherical Fermi surface, the interaction

energy is proportional to cos(2K sub F R)/R to the 5th power. The fall-off is faster than the corresponding escillatory interaction between two impurities in the bulk, which varies as cos(22k sub F R)/R. For substrates with a partially filled surface band, the interaction energy falls off much more slowly. Under simple assumptions, the interaction behaves as cos(2K sub f R)/R squared. Comparisons are made with the numerical calculations by Einstein and Schrieffer. The experimental results of Tsong on Re atoms adsorbed on W using field-ion microscopy are also discussed. GRA

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

N77-33968# Oak Ridge National Lab., Tenn. Engineering Technology Div.

SURVEY OF NUCLEAR FUEL CYCLE ECONOMICS: 1970 - 1985

B. E. Prince, J. P. Peerenboom, and J. G. Delene Mar. 1977 142 p refs

(Contract W-7405-eng-26)

(ORNL-TM-5703) Avail: NTIS HC A07/MF A01

Factors are presented that may affect nuclear fuel cycle economics through about 1985. The nuclear fuel cycle was surveyed as to past trends, current problems, and future considerations. Unit costs were projected for each step in the fuel cycle. Nuclear fuel accounting procedures were reviewed; methods of calculating fuel costs were examined; and application was made to Light Water Reactors (LWR) over the next decade. A method conforming to Federal Power Commission accounting procedures and used by utilities to account for backend fuel-cycle costs was described which assigns a zero net salvage to discharged fuel. LWR fuel cycle costs of from 4 to 6 mills/kWhr (1976 dollars) were estimated for 1985. These are expected to reach 6 to 9 mills/kWr if the effect of inflation is included. ERA

74 OPTICS

Includes light phenomena.

N77-33969*# American Science and Engineering, Inc., Cambridge, Mass.

UPGRADING AND TESTING PROGRAM FOR NARROW BAND HIGH RESOLUTION PLANETARY IR IMAGING SPECTROMETER Final Report

R. B. Wattson and Saul Rappaport Aug. 1977 57 p refs

(Contracts NASw-2883; NASw-3066)

(NASA-CR-155149; ASE-4173) Avail: NTIS HC A04/MF A01 CSCL 20F

An imaging spectrometer, intended primarily for observations of the outer planets, which utilizes an acoustically tuned optical filter (ATOF) and a charge coupled device (CCD) television camera was modified to improve spatial resolution and sensitivity. The upgraded instrument was a spatial resolving power of approximately 1 arc second, as defined by an f/7 beam at the CCD position and it has this resolution over the 50 arc second field of view. Less vignetting occurs and sensitivity is four times greater. The spectral resolution of 15 A over the wavelength interval 6500 A - 11,000 A is unchanged. Mechanical utility has been increased by the use of a honeycomb optical table, mechanically rigid yet adjustable optical component mounts, and a camera focus translation stage. The upgraded instrument was used to observe Venus and Saturn. Author

N77-33970# Polytechnic Inst. of New York, Brooklyn. Dept. of Electrical Engineering and Electrophysics.

A STUDY OF BEAM COUPLERS FOR INTEGRATED OPTICS Final Report, 1 Feb. 1973 - 31 Jan. 1977

Theodor Tamir Jun. 1976 16 p refs

(Contracts N00014-67-A-04-38-0014; N00014-75-C-0421)

(AD-A042070; POLY-EE/EP-77-031) Avail: NTIS HC A02/MF A01 CSCL 20/6

The theoretical study of beam couplers that convert an optical beam into a guided surface wave, or vice-versa, has produced the following results: (1) A unified leaky-wave approach to beam couplers of the prism and grating varieties; (2) A procedure for beam shaping by varying the parameters of the guiding surface-wave structure; (3) A rigorous solution of scattering by dielectric gratings, which form the basis of grating couplers; (4) A demonstration of a novel directional blazing effect of surface waves by asymmetric gratings; (5) An approximate analysis of the properties of dielectric gratings, which has an accuracy that is adequate for their practical design; (6) The development of equivalent electric network for describing the coupling operation of dielectric grating, and (7) The formulation of simple criteria for the design and fabrication of such gratings. GRA

N77-33971# Northrop Research and Technology Center, Hawthorne, Calif.

OPTICAL COATINGS 2-6 MICRONS Progress Report, Jan. - Mar. 1977

P. Kraatz May 1977 44 p refs

(Contract N00123-76-C-1321)

(AD-A041130) Avail: NTIS HC A03/MF A01 CSCL 11/3

Progress under Contract No. N00123-76-C-1321 is reported here. The report is divided into three sections covering coating materials and deposition, coating properties (growth rates, refractive indices, and absorption coefficients) and future plans. GRA

N77-33972# Ohio State Univ., Columbus. Electroscience Lab.

AN IMPROVED FORMULATION FOR EXTENDING THE GEOMETRICAL THEORY OF DIFFRACTION BY THE MOMENT METHOD

John Sahalos and Gary A. Thiele May 1977 27 p refs

(Contract N00014-76-C-0573)

(AD-A041775; ESL-4372-2) Avail: NTIS HC A03/MF A01 CSCL 20/6

Previous work in extending the GTD via the moment method required special consideration for those cases where the incident ray was nearly tangent to one of the faces of the wedge. This difficulty may be overcome by using a series of three terms based upon approximate expressions for the Fresnel integral. Results are shown for the currents on the faces of a wedge calculated with the improved formulation and these are compared with the exact results. In all cases agreement is excellent. Author (GRA)

N77-33973# Colorado State Univ., Fort Collins. Dept. of Atmospheric Sciences.

A POLYNOMIAL REPRESENTATION OF 6-3 MICROMETERS WATER VAPOR AND 4.3 MICROMETERS CO2 ATMOSPHERIC TRANSMISSIVITIES

Patrick Minnis and Stephen K. Cox Dec. 1976 28 p refs

(Grants NSF OCD-72-01681; NSF OCD-74-21678)

(PB-267593/2; AS-Paper-264) Avail: NTIS HC A03/MF A01 CSCL 20F

A mathematical model was formulated for depicting 6.3 micrometers H2O and 4.3 micrometers CO2 transmissivities in the atmosphere. A six degree function using a corrected optical path is found sufficient for expressing convolved tabulated transmittance data of 10/cm resolution, with an RMS error of about one percent transmission. With this model transmissivities may be calculated for many spectral intervals in a relatively small amount of time with the precision required for most atmospheric problems. GRA

N77-33974# Raytheon Co., Waltham, Mass. Research Div.

DEVELOPMENT OF LOW-COST HARDENED ZINC SELENIDE FOR IR WINDOWS Final Technical Report, 15 May 1975 - 15 Dec. 1976

A. Swanson, R. Donadio, and J. Pappis Apr. 1977 98 p

(Contract F33615-75-C-5131)

(AD-A042147; S-2140) Avail: NTIS HC A05/MF A01 CSCI 07/2

This development program has established the feasibility of fabricating large-size (13 x 20 in.) durable multispectral FLIR windows by a chemical vapor deposition process at a cost consistent with the program goals. The window is a composite that consists of two layers; a relatively thick (approximately equal to 0.6 in.) zinc selenide substrate and thin (approximately equal to 0.5 in.) zinc sulfide overcoat. The overcoat is grown on a polished surface of the selenide by a CVD technique. The purpose of the overcoat is to protect the zinc selenide from damage by the impingement of rain drops and other particles at high speeds. Optical evaluation of the composite window indicates that it is capable of meeting specifications of high resolution FLIR systems. GRA

N77-33975# Army Construction Engineering Research Lab., Champaign, Ill.
THE EFFECTS OF FAST AND THERMAL NEUTRON FLUX AND GAMMA RADIATION ON THE TRANSMISSION CHARACTERISTICS OF OPTICAL FIBERS Interim Report
D. C. Sieber, R. G. McCormack, and W. J. Croisant Jul. 1977 26 p refs
(AD-A042429; CERL-IR-E-112) Avail: NTIS HC A03/MF A01 CSCL 18/6

This report presents the results of a study of the effects of nuclear radiation on the light transmission characteristics of optical fibers. Two types of radiation were used: 1800-MW pulses of primarily thermal neutrons (10 to the 12th power n/sq cm), and a 20-minute exposure of thermal and fast neutrons and gamma radiation. Three representative types of optical fibers were tested: low-loss fused silica, medium-loss lead silicate with borosilicate cladding, and plastic. The fibers' radiation-induced attenuation changes and luminescence were monitored. Thermal neutrons were found to induce both attenuation increases and luminescence in all three fiber types. Fibers made of lead silicate with borosilicate cladding were found to develop a permanent attenuation increase of greater than 300 dB/km, making the fiber useless for most communication systems. GRA

N77-33976# Los Alamos Scientific Lab., N. Mex.
RECONSTRUCTION OF A SOURCE FROM A FEW (2 OR 3) PROJECTIONS
G. N. Minerbo and J. G. Sanderson Mar. 1977 40 p refs
(Contract W-7405-eng-36)
(LA-6747-MS) Avail: NTIS HC A03/MF A01

Two-dimensional sources were reconstructed from projection data when only two or three views were available. For the two-view problem, analytic solutions are obtained corresponding to several optimization criteria. These provide useful insight about reconstruction techniques, but in practice they do not produce reliable reconstructions, even for simple shapes. For the three-view problem, numerical tests with algorithms based on the Algebraic Reconstruction Technique (ART) are presented. A refinement of one of the ART algorithms is described, and numerical convergence criteria are obtained. A comparison among four algorithms for a variety of test patterns is given. Examples are considered which show the effect of noise of systematic errors in the data. The results indicate that, with three views, reliable reconstructions can be obtained, provided that the source has a limited amount of structure or is close to circular symmetry in shape. ERA

N77-33977# National Bureau of Standards, Washington, D. C. Optical Physics Div.
SELF-STUDY MANUAL ON OPTICAL RADIATION MEASUREMENTS. PART 1: CONCEPTS, CHAPTER 6. DISTRIBUTION OF OPTICAL RADIATION WITH RESPECT TO POLARIZATION Final Report
Fred E. Nicodemus, ed. and John B. Shumaker Jun. 1977 66 p refs
(PB-268502/2; NBS-TN-910-3-Pt-1) Avail: NTIS HC A04/MF A01 CSCL 20F

The concepts necessary to include polarization in classical radiometry are development. The treatment is based upon the Stokes polarization vector of spectral radiance and Mueller transmittance matrices. The Mueller matrices of many common polarizing optical components are discussed. Considerable attention is paid to the measurement of the Stokes spectral radiance vector components and to the measurement of the Mueller transmittance matrix elements. The concepts and techniques are illustrated by discussions of such subjects as radiometer calibrations, three-polarizer attenuators, depolarizers, and the characterization of Polaroid-type polarizers. Also included are an appendix on matrix multiplication and an appendix showing one way by which, in principle, any Mueller transmittance matrix may be measured. GRA

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N77-33978# Nagoya Univ. (Japan). Inst. of Plasma Physics.
EQUILIBRIUM OF REB-RING WITH SOFT-CORE
K. Ikuta Oct. 1976 13 p refs
(IPPJ-260) Avail: NTIS HC A02/MF A01

An equilibrium configuration of a charge-neutralized toroidal relativistic electron beam (REB ring) with a current-carrying plasma column to provide the toroidal field is calculated analytically. This plasma column is called soft-core. There exists an equilibrium of REB ring with a stable soft-core provided that the length of the core is shorter than a critical length. Author

N77-33979# Nagoya Univ. (Japan). Inst. of Plasma Physics.
END PLUGGINGS OF A LINEAR THETA PINCH BY HOT HIGH Z PLASMAS OF HIGH MASS NUMBER
Kei-ichi Hirano and Masahiro Wakatani Oct. 1976 19 p refs
(IPPJ-262) Avail: NTIS HC A02/MF A01

End plugging of a theta-pinch by high temperature plasma of high mass number is proposed. Using two different simplified models, thermal insulation mode (TIM) and free expansion mode (FXM), characteristic parameters interested in CTR reactor are calculated. The TIM claims that the energy is lost through the electron thermal conduction, whereas in the FXM the plasma energy is carried out with the plasma flowing along the magnetic field line. In the TIM the thermal insulation is improved due to the high Z number of plugging plasmas. In the FXM inertia of the high mass ions contribute to reduce the plasma expansion speed along it. A typical example of the length of the system will be 68 m for the Lawson criterion experiment under the operation of 200 kG. Author

N77-33980# Nagoya Univ. (Japan). Inst. of Plasma Physics.
TRAPPING AND DETRAPPING IN A SINGLE WAVE AND PARTICLE ACCELERATION IN A MAGNETOPLASMA
Ryo Sugihara and Yukio Midzuno Oct. 1976 16 p refs
(IPPJ-263) Avail: NTIS HC A02/MF A01

Particle motion within one bounce period pi/omega sub B is considered when the cyclotron frequency omega sub C is comparable with omega sub B. The equation of motion with an approximation is solved analytically for certain initial values. The analytical solution thus obtained agrees quite well with numerically computed results over a wide range of omega sub C and omega sub B. It is shown that under some conditions the particle is accelerated quite efficiently as compared with that in an unmagnetized plasma. Author

N77-33981# Nagoya Univ. (Japan). Inst. of Plasma Physics.
NEW LENS SYSTEM USING TOROIDAL MAGNETIC FIELD FOR INTENSE ION BEAMS
Akihiro Mohri, Kazunari Ikuta, and Junji Fujita Nov. 1976 25 p refs
(IPPJ-264) Avail: NTIS HC A02/MF A01

The use of toroidal magnetic field as a lens system is proposed for producing intense ion beam. The characteristics of the lens system are obtained both analytically and numerically. Some examples of ray-trajectories are presented for different focal lengths. The system is applicable to neutral beam injection heating and micro-pellet i implosion for nuclear fusion, and to the other fields such as ion beam X-ray lasers. Author

N77-33982# Nagoya Univ. (Japan). Inst. of Plasma Physics
NONLINEAR PROPAGATION OF THE ORDINARY MODE IN A HOT MAGNETOPLASMA
Tu Khiet (Paris-Sud Univ., Orsay, France), Y. Furutani (Okayama

Univ., Japan), and Y. H. Ichikawa Nov. 1976 35 p refs
(IPPJ-265) Avail: NTIS HC A03/MF A01

Kinetic theory of the self-modulation of a quasi-monochromatic ordinary wave propagating across an external magnetic field is presented. Explicit expressions of the dispersion and the nonlinear coupling coefficients are given for a Maxwellian plasma. In the limit of zero-temperature, a Karpman-Kruskal linear stability of the O-mode envelop is discussed. Author

N77-33983# Nagoya Univ. (Japan). Inst. of Plasma Physics.
COMPUTER SIMULATIONS ON THE NONLINEAR FREQUENCY SHIFT AND NONLINEAR MODULATION OF ION-ACOUSTIC WAVES
Yukiharu Ohsawa and Tetsuo Kamimura Nov. 1976 25 p refs
(IPPJ-266) Avail: NTIS HC A02/MF A01

The nonlinear behavior of ion acoustic waves with rather short wavelength was investigated by computer simulation. The nonlinear frequency shift is negative and is proportional to the square root of the initial wave amplitude when the amplitude is approximately less than 0.1. This proportionality breaks down and the frequency shift can become positive for large temperature ratios. Then the amplitude is approximately greater than 0.1. Nonlinear modulation of the wave packet was clearly seen; however, no modulational instability was observed. The importance of the effects of the trapped ions to these phenomena is discussed. Author

N77-33984# Nagoya Univ. (Japan). Inst. of Plasma Physics.
DIFFUSION OF A MULTI-ION SPECIES PLASMA DUE TO DRIFT WAVE FLUCTUATIONS
Toshio Tange (Hiroshima Univ.), Kimitaka Itoh (Tokyo Univ.), Sanae Inoue (Tokyo Univ.), and Kyoji Nishikawa (Hiroshima Univ.) Dec. 1976 33 p refs
(IPPJ-267) Avail: NTIS HC A02/MF A01

A general theory is presented for the diffusion of a multi-ion species plasma across magnetic field due to electrostatic fluctuations. The theory is based on the weak turbulence theory for an isothermal plasma in a slab geometry. The diffusion flux due to wave-particle interactions was shown to be not necessarily proportional to the density gradient of the particle species of interest. The result is applied to the impurity diffusion due to those drift waves which exist in a single ion-species plasma. The dominant nonlinear effect is the scattering of waves on ions and the resulting diffusion constant of the host ions is derived. The impurity diffusion constant is positive (or negative) if the impurity Larmour radius is smaller (or greater) than the host-ion Larmour radius, and becomes greater than the host diffusion constant if the spectrum is localized in the unstable region. Author

N77-33985# Nagoya Univ. (Japan). Inst. of Plasma Physics.
THE NONLINEAR DISTORTION OF PROPAGATION CONES OF LOWER HYBRID WAVE IN AN INHOMOGENEOUS PLASMA
Heiji Sanuki and Tatsuki Ogino (Nagoya Univ.) Dec. 1976 19 p refs
(IPPJ-268) Avail: NTIS HC A02/MF A01

Nonlinear propagation of externally driven waves in the lower hybrid frequency range in an inhomogeneous plasma were investigated. Equations were derived to determine finite temperature, plasma inhomogeneity, and density depression due to ponderomotive forces. Results show that the waves are localized in a spatial wave packet that propagates into the plasma center along the conical trajectory which makes a small angle with respect to the confining magnetic field. Author

N77-33986# Nagoya Univ. (Japan). Inst. of Plasma Physics.
EFFECTS OF NUCLEAR FUSION ON REACTION ON DIFFUSION AND THERMAL CONDUCTION IN A MAGNETOPLASMA
Kazuo Sakai (Tokyo Univ.) and Osamu Aono (Jichi Medical School) Dec. 1976 24 p refs
(IPPJ-269) Avail: NTIS HC A02/MF A01

Transport coefficients concerning the diffusion and the thermal conduction across a strong magnetic field are calculated in the presence of the deuteron-triton fusion reaction on the basis of the gas kinetic theory. When the reaction takes place, the diffusion increases and the thermal conduction decreases. Effects of the reaction exceed those of the Coulomb collision as the temperature is high enough. Author

N77-33987# Nagoya Univ. (Japan). Inst. of Plasma Physics.
HELICALLY SYMMETRIC EQUILIBRIUM OF CURRENT-CARRYING FINITE BETA PLASMA
Masami Fujiwara, Yasuji Hamada, Masami Fujiwara, and Kenro Miyamoto Dec. 1976 16 p refs
(IPPJ-270) Avail: NTIS HC A02/MF A01

The magnetohydrodynamic equilibrium equation of a helically symmetric system was used to determine the equilibrium characteristics of a longitudinal current-carrying finite beta plasma. Analytical expression of the rotational transform angle indicates that the contribution due to the helical component of the plasma current should be taken into account in addition to the rotational transform angle due to the external helical current and the longitudinal plasma current. Author

N77-33988# Nagoya Univ. (Japan). Inst. of Plasma Physics.
PARAMETRIC DECAY OF LOWER HYBRID WAVE INTO DRIFT WAVES
Heiji Sanuki Dec. 1976 19 p refs
(IPPJ-272) Avail: NTIS HC A02/MF A01

The stimulated scattering of a drift Alfven wave in an inhomogeneous magnetized plasma was investigated. The resonance backscattering instability is found to yield the minimum threshold. Author

N77-33989# Nagoya Univ. (Japan). Inst. of Plasma Physics.
OBSERVATION OF CURRENT-DRIVEN ION SOUND WAVE IN A TURBULENTLY HEATED PLASMA: THE MACH 2
Y. Amagishi (Shizuoka Univ.), H. Iguchi, Y. Ito (Hiroshima Univ.), T. Kawabe (Tsukuba Univ.), A. Mase, and T. Tsukishima Jan. 1977 17 p refs
(IPPJ-274) Avail: NTIS HC A02/MF A01

The microwave scattering method was used to measure the dynamic characteristics of turbulence in a turbulently heated plasma. Scattered signals were observed at the time before the plasma becomes resistive. The phase velocity of the wave increases with time. The value of the phase velocity is found to be consistent with that of the ion sound wave propagating across the magnetic field, when the increase of the phase velocity is interpreted as due to the increase of the electron temperature. Author

N77-33990# Nagoya Univ. (Japan). Inst. of Plasma Physics.
NONLINEAR ELECTROSTATIC ION CYCLOTRON WAVES IN AN RF-PLUGGED INHOMOGENEOUS PLASMA SLAB
Tsutomu Ikemura Jan. 1977 48 p refs
(IPPJ-275) Avail: NTIS HC A03/MF A01

A theory based on the fluid and perturbation theories was developed to analyze a nonlinear electrostatic ion cyclotron wave excited in an rf-plugged inhomogeneous plasma slab by applying a pair of external potentials at its boundaries. The potential forms of the fundamental and the nonlinear second harmonic were found. In the core region of the slab, the electric field created by the fundamental potential can approximately be regarded as a dipole field. Under the stricter condition micron approximately 1, a dipole-like electric field can also be excited in the entire region for the case of high density and weak nonlinearity.
Author

N77-33991# Nagoya Univ. (Japan). Inst. of Plasma Physics.
THEORY FOR SPACE-TIME EVOLUTION OF EXPLOSIVE-TYPE INSTABILITY
M. Watanabe (Hiroshima Univ.), Kyoji Nishikawa (Hiroshima Univ.), and H. Wilhelmsson (Chalmers Univ. of Technol.) Jan. 1977 11 p refs
(IPPJ-276) Avail: NTIS HC A02/MF A01

A solution is presented describing space-time evolution of a resonantly interacting system of a damped negative energy wave and two undamped wave packets of positive energies. It is shown that all three waves grow simultaneously when they are approaching each other, while a certain threshold condition is required for instability when they are separating. Author

N77-33992# Nagoya Univ. (Japan). Inst. of Plasma Physics.
CONTRIBUTION OF HIGHER ORDER TERMS IN THE REDUCTIVE PERTURBATION THEORY. 2: A CASE OF STRONGLY DISPERSIVE WAVE
Yoshi H. Ichikawa, Teruo Mitsuhashi (Nihon Univ.), and Kimiaki Konno (Nihon Univ.) Jan. 1977 23 p refs
(IPPJ-277) Avail: NTIS HC A02/MF A01

Nonlinear modulation of a strongly dispersive ion plasma wave in a collisionless plasma composed of cold ions and warm electrons was analyzed to illustrate the higher order contributions of the reductive perturbation expansion in the strongly dispersive system. The basic set of fluid equations was reduced to a coupled set of the nonlinear Schrodinger equation for the first order perturbed potential and a linear inhomogeneous equation for the second order perturbed potential. A steady state solution of the coupled set of equations was solved analytically in the asymptotic limit of small wave number. Author

N77-33993# Nagoya Univ. (Japan). Inst. of Plasma Physics.
SATURATION OF KINK INSTABILITY AND HELICAL EQUILIBRIUM OF CURRENT CARRYING PLASMA COLUMN
Kimitaka Itoh, Sanae Inoue, and Shoichi Yoshikawa (Princeton Univ.) Feb. 1977 12 p refs
(IPPJ-278) Avail: NTIS HC A02/MF A01

By means of the neighboring equilibrium method the saturation level of the kink instability of a current carrying plasma column is investigated. We obtain the helical equilibrium which is the stationary saturated stage of kink instability. The analysis is performed for the rounded current profile case and shows that the shell has very strong suppression effect on the saturation level. Author

N77-33994# Nagoya Univ. (Japan). Inst. of Plasma Physics.
REAL-SPACE QUASILINEAR THEORY OF DRIFT IN A SHEARED MAGNETIC FIELD
Tadatsugu Hatori, Y. C. Lee (Hiroshima Univ.), and Toshio Tange (California Univ., Los Angeles) Feb. 1977 21 p refs
(IPPJ-279) Avail: NTIS HC A02/MF A01

A real-space quasilinear theory is developed for the collisional and the collisionless drift waves in a plasma with a sheared magnetic field of slab geometry. The equation obtained describes the interaction between many localized modes around different rational surfaces through the density modulation of the energy source region of each mode. The wave amplitudes approach to the stationary values through a relaxation oscillation process. When the widths of the energy source region becomes comparable to the spacing of the two adjacent rational surfaces, diffusion coefficient due to the wave is enhanced over the classical value, while the nonlocal heat transport due to the wave propagation is shown to be negligible compared to that associated with the diffusion process. Author

N77-33995# Nagoya Univ. (Japan). Inst. of Plasma Physics.
EXPERIMENTAL STUDY ON SELF-MODULATION OF ION PLASMA OSCILLATIONS
Tadao Honzawa Feb. 1977 29 p refs
(IPPJ-280) Avail: NTIS HC A03/MF A01

The self-modulation of externally amplitude-modulated ion plasma oscillations was investigated. Oscillations were excited by applying an rf voltage with a frequency near the ion plasma frequency to a grid being a wall of the plasma container. The envelopes of such oscillations were observed to break up into several spikes if their amplitudes were above a value. Individual spikes thus formed were found to have similar properties to those of envelope solutions. The number of spikes per group was observed to depend strongly on various parameters. Frequency spectra of excited oscillations were studied over various amplitudes of the applied rf voltage. Comparison of these experimental results with theoretical ones indicates that the self-modulation of oscillations observed here occurs due to the modulational instability. Author

N77-33996# Nagoya Univ. (Japan). Inst. of Plasma Physics.
NONLINEAR HEAT AND PARTICLE TRANSPORT DUE TO COLLISIONAL DRIFT WAVES
Ken-ichi Nishi-Kawa, Tadatsugu Hatori, and Yoshinosuke Terashima Mar. 1977 33 p refs
(IPPJ-281) Avail: NTIS HC A03/MF A01

The nonlinear evolution of unstable modes which govern transport processes in magnetically confined plasmas were investigated. A nonlinear theory of unstable collisional drift wave, and the consequent nonlinear transport were extended to include electron and ion temperature gradients. Thermal transport properties are discussed and basic equations are given. Author

N77-33997# Nagoya Univ. (Japan). Inst. of Plasma Physics.
THEORY OF TWO-FLUID EQUILIBRIUM OF AN AXIALLY SYMMETRIC PLASMA
T. Watanabe and Kyoji Nishikawa Mar. 1977 25 p refs
(IPPJ-282) Avail: NTIS HC A02/MF A01

The two-fluid equilibrium of an axially symmetric plasma may be determined by a formula which is particularly useful for the case when a local charge separation causes a deviation of the equipotential surface from the magnetic surface. The inertia force due to plasma motion is considered in the form of a modified electrostatic potential (caused by centrifugal force) and a modified magnetic field (caused by Coriolis force). A set of partial differential equations which determine the modified flux functions and the self-consistent electric and magnetic fields are derived. The poloidal drift flux on the modified magnetic surface and the density and temperature in the absence of both the electrostatic potential and the plasma flow are assumed. The result is formulated as a variation principle which contains no constraints and hence is useful for numerical and perturbational analysis. Author

N77-33998# Nagoya Univ. (Japan). Inst. of Plasma Physics.
STUDY ON RF VOLTAGE BREAKDOWN FOR LHRH IN 0.8 - 0.9 GHz
Kunizo Ohkubo and Kiyokata Matsuura Mar. 1977 29 p refs
(IPPJ-J-27) Avail: NTIS HC A03/MF A01

Radio frequency breakdown in the frequency range of 0.8 to 0.9 GHz was investigated in a re-entrant type resonator and in a partially concave waveguide. Characteristics of the breakdown are significantly dependent on the uniformity of the RF field as well as the presence of initial electrons, but independent of the filling pressure of hydrogen gas below .001 torr. The mechanism of breakdown is mainly reduced to the secondary electron resonance breakdown. Author

N77-33999*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A HOLLOW CATHODE HYDROGEN ION SOURCE
J. S. Sovey and M. J. Mirtich Oct. 1977 10 p refs Presented at 7th Symp. on Eng. Probl. of Fusion Res., Knoxville, Tenn., 25-28 Oct. 1972; sponsored by IEEE, Inc.
(NASA-TM-73783; E-9345) Avail: NTIS HC A02/MF A01 CSCL 20I

High current density ion sources have been used to heat plasmas in controlled thermonuclear reaction experiments. High beam currents imply relatively high emission currents from cathodes which have generally taken the form of tungsten filaments. A hydrogen ion source is described which was primarily developed to assess the emission current capability and design requirements for hollow cathodes for application in neutral injection devices. The hydrogen source produced ions by electron bombardment via a single hollow cathode. Source design followed mercury ion thruster technology, using a weak magnetic field to enhance ionization efficiency. Author

N77-34000*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ALTERNATIVE APPROACHES TO PLASMA CONFINEMENT
J. Reece Roth May 1977 79 p refs Presented at Minicourse on Controlled Fusion, Troy, N. Y., 25-27 May 1977; sponsored by IEEE
(NASA-TM-X-73793; E-9361) Avail: NTIS HC A05/MF A01 CSCL 20I

The potential applications of fusion reactors, the desirable properties of reactors intended for various applications, and the limitations of the Tokamak concept are discussed. The principles and characteristics of 20 distinct alternative confinement concepts are described, each of which may be an alternative to the Tokamak. The devices are classed as Tokamak-like, stellarator-like, mirror machines, bumpy tori, electrostatically assisted, migma concept, and wall-confined plasma. Author

N77-34001# Nagoya Univ. (Japan). Inst. of Plasma Physics.
POSSIBILITY OF STABLE IMPLOSION OF STRUCTURED PELLET. 1
T. Yabe and K. Niu Jun. 1977 17 p refs
(IPPJ-293) Avail: NTIS HC A02/MF A01

The scheme for stable implosion is proposed and discussed. The asymptotic theory which is one branch of homogeneous isentropic compression scheme is derived and ascertained by numerical simulations. Author

N77-34002# Nagoya Univ. (Japan). Inst. of Plasma Physics.
MICROINSTABILITIES IN A PLASMA SLAB WITH STEEP DENSITY GRADIENT
Heiji Sanuki and Tsuguhiro Watanabe Jun. 1977 22 p refs
(IPPJ-294) Avail: NTIS HC A02/MF A01

An integral dispersion relation in k-space was derived for the linear normal modes of electrostatic perturbations in an inhomogeneous plasma under the presence of a strong ambipolar electric field. This ambipolar field causes electron drift with the velocity shear. Under a local method the effects of ambipolar field and magnetic curvature on drift wave were investigated in a cusped configuration system. The cusped magnetic curvature tends to have a stabilizing effect in addition to the ambipolar field on a drift instability. Author

N77-34003# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ANOMALOUS EFFECT OF SMALL COLLISIONS ON THE NONLINEAR INTERACTION IN A SMALL COLD BEAM AND A WARM PLASMA SYSTEM
Osamu Fukumasa, Hirotada Abe, and Ryohei Itatani Jul. 1977 18 p refs
(IPPJ-295) Avail: NTIS HC A02/MF A01

A nonlinear wave-particle interaction based on the single wave model is changed strongly by introducing small collisions into plasma electrons. These collisions are too small to change the linear stage. However, they alter the phase relation between the single wave and the trapped electrons in the nonlinear stage. As a result, the wave amplitude of the first minimum decreases anomalously and the persistent trapped particle oscillations in collisionless cases are destroyed. Author

N77-34004# Nagoya Univ. (Japan). Inst. of Plasma Physics.
PARTICLE SIMULATION ON THE PROPAGATION AND PLASMA HEATING OF THE LOWER HYBRID WAVE IN THE NONUNIFORM SYSTEM
Hirotada Abe, Hiroyuki Kajitani, and Ryohei Itatani Jul. 1977 50 p refs
(IPPJ-296) Avail: NTIS HC A03/MF A01

A particle simulation model which treats the wave excitation and propagation in the nonuniform density by the external source is developed and applied for study of the lower hybrid heating in a fusion device. When the wave amplitude is large or the wave energy is about a half of the initial kinetic energy at a surface of plasma, the following features are observed for the increase of the ion and electron kinetic energies: Ion perpendicular energy distributions are approximated by the two Maxwell distributions or have the components of the high energy tail, whose parallel velocities satisfy the resonance condition. A strong increase of the parallel kinetic energy of the electron is observed near the plasma surface. These are mainly due to the trapped electrons and the collisional heating. Author

N77-34005# Nagoya Univ. (Japan). Inst. of Plasma Physics.
PROPAGATION OF NONLINEAR ION ACOUSTIC WAVE WITH GENERATION OF LONG-WAVELENGTH WAVES
Yukiharu Ohsawa and Tetsuo Kamimura Jul. 1977 29 p refs
(IPPJ-297) Avail: NTIS HC A03/MF A01

The nonlinear propagation of the wave packet of an ion acoustic wave with the electron Debye wavenumber is investigated by computer simulations. From the wave packet of the ion acoustic wave, waves with long wavelengths are observed to be produced within a few periods for the amplitude oscillation of the original wave packet. These waves are generated in the region where the original wave packet exists. Their characteristic wavelength is of the order of the length of the wave packet, and their propagation velocity is almost to the ion acoustic speed. The long-wavelength waves thus produced strongly affect the nonlinear evolution of the original wave packet. Author

N77-34006# Naval Research Lab., Washington, D. C.
REVISED AND ENLARGED COLLECTION OF PLASMA PHYSICS FORMULAS AND DATA Final Report
D. L. Book May 1977 106 p refs
(NRL Proj. A03-16)
(AD-A041545; NRL-MR-3332) Avail: NTIS HC A06/MF A01 CSCL 20/5

This report is intended to serve as a kind of users' manual for the NRL Plasma Formulary, supplying explanations, worked examples and references, for which space in the pocket version was insufficient. A certain amount of supplementary material has been included. Author (GRA)

N77-34007# Naval Research Lab., Washington, D. C. Plasma Physics Div.
FORMATION AND ADIABATIC COMPRESSION OF REVERSED-FIELD THETA PINCHES IN IMPLODING LINERS
D. L. Book, D. Hammer (Calif. Univ., Los Angeles), and P. J. Turchi Feb. 1977 36 p
(Contract E(49-20)-1009)
(AD-A041737; NRL-MR-3491) Avail: NTIS HC A03/MF A01 CSCL 20/9

The formation and compression of e-beam-induced reversed-field theta pinch configurations is studied in an MHD treatment. Taking into account classical collisional resistivity plus anomalous resistivity derived from microinstabilities, it is shown that plasmas can be created with parameters suitable for liner compression experiments. Adiabatic compression of the quasi-equilibrium plasma/flux mixture is described using Lagrangian coordinates. Results are given for a sample (unoptimized) initial configuration. In the final state the average beta and the total D-T rate are approximately 10-20% of the values which would be obtained if all the compressional energy went into heating plasma. Author (GRA)

N77-34008# Mission Research Corp., Santa Barbara, Calif.
ADIABATIC OSCILLATIONS OF THE ONE-DIMENSIONAL SGEMP BOUNDARY LAYER
Roger Stettner Oct. 1976 42 p refs
(Contract DNA001-77-C-0009)
(AD-A041960; MRC-R-291; DNA-4152T) Avail: NTIS HC A03/MF A01 CSCL 20/9

Adiabatic oscillations of the one-dimensional SGEMP boundary layer about equilibrium are described in a fluid approximation. The solution for monoenergetic emission normal to the surface is found and compared with a computer solution. Solutions for photoelectron emission with a cosine distribution for a monoenergetic and a linear times exponential energy distribution are also found. It appears that these latter solutions are not physically meaningful. If physically meaningful modes of oscillation do exist, for other emission configurations, they are probably stable. Author (GRA)

N77-34009# Energy Research and Development Administration, Washington, D. C. Div. of Magnetic Fusion Energy.
SECOND WORKSHOP ON CONCEPTUAL DESIGN STUDIES OF EXPERIMENTAL POWER REACTOR-1
M. Murphy Mar. 1977 68 p Workshop Held at Madison, Wisc., 4-5 Nov. 1976
(ERDA-77-36) Avail: NTIS HC A04/MF A01

An independent assessment of the ANL, GA, and ORNL design by other members of the fusion community is presented. The following reports are included: (1) toroidal coils, (2) first wall, blanket, and shield, (3) tritium systems, (4) initial assembly, maintenance in a radiation environment, (5) plasma physics, (6) poloidal coils, (7) project engineering, BOP, cost, and scheduling, and (8) plasma support systems. ERA

N77-34010# Princeton Univ., N. J. Plasma Physics Lab.
PHYSICS STUDIES FOR TFTR
Feb. 1977 91 p
(Contract EY-76-C-02-3073)
(TID-27494) Avail: NTIS HC A05/MF A01

Discussions are given on the following topics: (1) system capability, (2) simulation of high current discharges, (3) neutral injection heating studies, and (4) the TFTR diagnostic system. ERA

N77-34011# California Univ., Livermore. Lawrence Livermore Lab.
FUSION-FISSION HYBRID REACTORS: A CAPSULE INTRODUCTION
J. P. Holdren 1 Feb. 1977 11 p refs
(Contract W-7405-eng-48)
(UCID-17397) Avail: NTIS HC A02/MF A01

Fusion-fission hybrid systems are reviewed, including: (1) basic technological characteristics; (2) potential applications; (3) relevance of environmental considerations in the development rationale for hybrids. References to the more technical literature are supplied. ERA

N77-34012# California Univ., Livermore. Lawrence Livermore Lab.
MIRROR REACTOR SURFACE STUDY
A. L. Hunt, C. C. Damm, A. H. Futch, J. R. Hiskes, R. G. Meisenheimer, R. W. Moir, T. C. Simonen, B. W. Stallard, and C. E. Taylor 1 Sep. 1976 244 p refs
(Contract W-7405-eng-48)
(UCID-17168) Avail: NTIS HC A11/MF A01

A general survey is presented of surface-related phenomena associated with the following mirror reactor elements: plasma first wall, ion sources, neutral beams, director converters, vacuum systems, and plasma diagnostics. A discussion of surface phenomena in possible abnormal reactor operation is included. Several studies which appear to merit immediate attention and which are essential to the development of mirror reactors are abstracted from the list of recommended areas for surface work. The appendix contains a discussion of the fundamentals of particle/surface interactions. The interactions surveyed are backscattering, thermal desorption, sputtering, diffusion, particle ranges in solids, and surface spectroscopic methods. A bibliography lists references in a number of categories pertinent to mirror reactors. Several complete published and unpublished reports on surface aspects of current mirror plasma experiments and reactor developments are also included. ERA

N77-34013# Battelle Pacific Northwest Labs., Richland, Wash.
FUSION SYSTEMS ENGINEERING
Jan. 1977 47 p refs Sponsored by ERDA
(BNWL-1939-6) Avail: NTIS HC A03/MF A01

A fissile breeding outside blanket for the Tokamak Engineering Test Reactor (TETR) is evaluated based upon near-term technological developments that could be implemented in the middle or late 1980's. With these constraints, uranium dioxide (UO2) has been identified as the fertile breeding material for production of plutonium, and the capability of a conceptual, UO2-fueled, outer blanket to produce power, plutonium, and tritium has been determined. Plutonium production rates and tritium breeding performance were also assessed in calculations using the conceptual TETR hybrid blanket with various technologically advanced fuels-UMo, UC, and U3Si. ERA

N77-34014# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
DYNAMICS OF A COAXIAL PLASMA GUN
M. A. Raadu Jan. 1977 31 p refs
(TRITA-EPP-77-02) Avail: NTIS HC A03/MF A01

The dynamics of an ionizing wave in a coaxial plasma gun with an aximuthal bias magnetic field was analyzed in a theoretical model. Only the radial dependence was treated and, instead of including a treatment of the energy balance, two separate physical assumptions are made. In the first case, it is assumed that the total internal electric field is given by the critical ionization velocity condition and, in the second, that the ionization rate is constant. For consistency, wall sheaths were assumed to match the internal plasma potential to that of the walls. On the basis of momentum and particle balance the radial dependence of the electron density, current density, electric field, and drift velocity were found. An electron source was required at the cathode and the relative contribution from ionization within the plasma was deduced. The assumption that there are no ion sources at the electrodes leads to a restriction on the possible values of the axial electric field. Author (ESA)

N77-34015# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics and Fusion Research.
ON THE STABILITY OF BALLOONING MODES IN THE BOUNDARY LAYER OF A GAS INSULATED PLASMA
Research and Training Programme on Controlled Thermonuclear Fusion and Plasma Physics (EUR-NE)
D. Ohlsson Apr. 1977 51 p refs Sponsored by EURATOM
(TRITA-PFU-77-04) Avail: NTIS HC A04/MF A01

In order to fulfill power density requirements in future steady-state fusion reactors the ion density in central parts must be of the order 10 to the 21st power per cu m. In such systems high density neutral gas will surround the hot plasma, whether introduced on purpose or not, provided the neutral gas flux from the plasma is not continuously removed by external means. In these types of gas insulated plasmas large density and pressure gradients will arise close to the boundaries due to plasma neutral gas interaction effects. The stability of gravitational driven ballooning modes in the boundary region was investigated. In particular, the coupling between plasma and neutral gas investigated in previous stability analysis was reconsidered. Also, effects previously neglected, for example the Nernst effect, was taken into account. Author (ESA)

N77-34016# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ROTATIONAL TRANSFORM ANGLE OF THE STELLARATOR FIELD WITH TWISTED COILS
Kazumi Ohasa and Kenro Miyamoto Dec. 1976 15 p refs
(IPPJ-271) Avail: NTIS HC A02/MF A01

The stellarator field produced by the system of twisted coils in the linear configuration is studied analytically. The current of this system can be represented by the superposition of the azimuthal components and the helical components. The rotational transform angle of this system is analyzed. It is found that the fundamental harmonic of the helical components of the current distribution gives the major contribution to the rotational transform angle. The numerical results in the case of the toroidal configuration are compared with the analytical results. Author

76 SOLID-STATE PHYSICS

Includes superconductivity.
For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N77-34017 Louisville Univ., Ky.
LATTICE DYNAMICS AND INTERMOLECULAR POTENTIALS FOR HYDROCARBONS Ph.D. Thesis
Thomas Louis Starr 1976 113 p
Avail: Univ. Microfilms Order No. 77-13771

A consistent model for the intermolecular potential hydrocarbons has been obtained from crystal data. This model uses the atom-atom method with a Buckingham potential and point charges. The potential parameters derived using two different methods are shown to give correspondingly good fits to the crystal structures. The inclusion of point charges of about .15 electrons results in a substantial inprovement in the potential. A general theoretical method for estimating the exponent of the repulsive potential is presented. The repulsion is taken proportional to the overlap of the atomic electron densities. This model is shown to give reasonably good values when compared to experimental results, and exponents for several atoms and ions are tabulated. Dissert. Abstr.

N77-34018*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MOSSBAUER EFFECT STUDIES IN IRON CONTAINING NONMAGNETIC IMPURITIES
Jag J. Singh Aug. 1977 20 p refs
(NASA-TM-74067) Avail: NTIS HC A02/MF A01 CSCL 20L

Mossbauer parameters of dilute quaternary (Fe-XYZ) alloys where X, Y, Z, are Al, Ge, and La, respectively were studied. A comparison between the computed and the observed values indicates that changes in effective hyperfine field, outer peak widths and the isomer shift predicted on the basis of binary alloys of the individual impurities are equal, within experimental errors, to those obtained in quaternary (Fe-XYZ) alloys. The effects of simultaneously present dilute impurities are shown to be

additive, independent of their respective electronic configurations. Author

N77-34019# California Univ., San Diego. Dept. of Physics.
GREEN'S FUNCTION CALCULATION OF A METAL-METAL INTERFACE Final Report, 31 Oct. 1976 - 1 Nov. 1977
A. Yaniv Jun. 1977 37 p refs Sponsored in part by NSF (Contract N00014-76-C-0050; NR Proj. 017-653)
(AD-A041918; TR-39) Avail: NTIS HC A03/MF A01 CSCL 20/12

The properties of metal-metal interfaces are of interest in many metallurgical applications. These include grain boundaries, crack growth, friction and bimetallic adhesion. This report discusses the electronic properties of a simple bimetallic junction. The method employed to investigate the interface were the Green's function technique and the phase shifts method. The Green's function of a simple junction within the tight-binding approximation was calculated. The conditions for the occurance of bound states was deduced from the poles of the Green's function. There are three types of wave functions associated with the interface. The first extends throughout the entire crystal, the second extends on one side of the interface only, whereas the third kind is localized near the interface. An expression for the change in density of states due to the creation of the interface was derived using the phase shift method. From this expression the corresponding single-particle contribution to the interface energy and the interface specific heat was derived.
GRA

N77-34020# Pennwalt Corp., King of Prussia, Pa. Research and Development Dept.
CRYSTAL STRUCTURE AND MAGNETIC STUDIES OF BIS(MU-DIBUTYLPHOSPHINATO) COPPER (II)
R. Cini, P. Colamarino, P. L. Orioli, L. S. Smith, P. R. Newman, H. D. Gillman, and P. Nannelli Jun. 1977 25 p refs
(Contract N00014-69-C-0122; NR Proj. 356-408)
(AD-A041510; TR-22) Avail: NTIS HC A02/MF A01 CSCL 07/4

The structure of Cu(OP(C4H9)2O)2 in the solid state has been determined by three-dimensional single-crystal X-ray techniques. The structure was solved by the heavy-atom technique, and least squares refinement gave an R factor of 0.061. The structure consists of polymeric chains of copper atoms linked by double phosphinate bridges. The coordination around each copper atom can be described as a very flattened tetrahedron. The g tensors for oriented single crystals were determined by ESR and range from 2.07 to 2.41, with the larger value in a direction nearly normal to a mean plane formed by the copper atoms and the ligands. The spin orbit coupling constant suggests considerable mixing of metal and ligand orbitals in this polymer.
GRA

N77-34021# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
CREEP AND RELAXATION BEHAVIOR OF VAPOR-DEPOSITED AMORPHOUS SELENIUM FILMS: FLOW BEHAVIOR OF GLASSY METALS Final Technical Report, 1 Jul. 1975 - 30 Sep. 1976
David Turnbull 6 Dec. 1976 8 p
(Contract N00014-76-C-0020)
(AD-A041111; TR-2) Avail: NTIS HC A02/MF A01 CSCL 20/12

It has been shown that a-Se films deposited from the vapor onto low temperature substrates, when annealed at or just below their glass temperatures, become indistinguishable, in flow and transformation behavior, from melt-quenched specimens. Photoillumination, in the visible range, of these films (a) sharply increases their rate of approach to configurational equilibrium while not affecting the flow rate of equilibrium, (b) greatly increases the number density of crystals heterogeneously nucleated while not producing measurable homogeneous nucleation, (c) generally increases the rates of growth of crystals within the films. It has been shown that the plastic deformation behavior of glassy metals can be represented satisfactorily by a deformation map of the type presented by Ashby and Frost for various crystalline materials. The available evidence indicates that the temperature dependence of the isoconfigurational creep rate below the glass temperature is relatively much smaller for metallic alloy than for non-metallic glasses. Author (GRA)

N77-34022# Westinghouse Electric Corp., Horseheads, N. Y. Industry and Government Tube Div.
MANUFACTURING METHODS AND ENGINEERING FOR TFT ADDRESSED DISPLAY Quarterly Report, 7 Aug. - 7 Nov. 1976
D. H. Davies, W. L. Rogers, T. Csakvary, H. Y. Wey, and H. M. Green Dec. 1976 52 p
(Contract DAAB07-76-C-0027)
(AD-A041754; Rept-77-8F9-PRODE-R-1; QR-2) Avail: NTIS HC A04/MF A01 CSCL 20/12

This is the second quarterly report on Contract DAAB07-76-C-0027; Manufacturing Methods and Technology Evaluation for the fabrication of a thin film transistor based solid state display panel. Progress in all scheduled tasks was made this quarter; the fabrication of the engineering samples (ES) through the use of a dedicated mask system is proving troublesome because of material interactions consequent upon the use of the laboratory fabrication unit. Initial tests indicate that this specific problem will not be a factor in the pilot manufacturing machine. Displays were made in the ES format with an X-Y mask system. They had a similar thin film material layout to the pilot unit's requirements. The overall quality level was reasonably good and initial tests indicate the display should meet the required specifications. The computer controlled pilot manufacturing unit is operating at overall satisfactory levels and good progress at reducing the level of elemental short circuits was made. All the tooling to make the displays on this unit is now ready and first complete displays from the pilot line are expected soon.
Author (GRA)

N77-34023# Pittsburgh Univ., Pa. Dept. of Chemistry.
INTERMETALLIC COMPOUNDS CONTAINING LANTHANIDES (STUDIES OF MAGNETIC ANISOTROPY) Final Report, 15 Jan. 1974 - 14 Jan. 1977
W. E. Wallace 24 May 1977 17 p refs
(Grants DAHC04-74-G-0102; DAAG29-76-G-0090)
(AD-A041947; ARO-11845.2-M5) Avail: NTIS HC A02/MF A01 CSCL 20/2

The powerful permanent magnetism of certain rare earth intermetallics (e.g., SmCo5) is a consequence of the strong magnetic anisotropy in these materials. Both sublattices contribute to magnetic anisotropy. Usually the contribution of the rare earth predominates over that of its chemical partner, a d-transition element in systems of practical interest. The rare earth anisotropy has been treated by quantum mechanics and is shown to be a crystal field effect. The partner element anisotropy has been studied experimentally and the details partially revealed. Magnetic interactions have been studied in a number of systems, particularly those involving Mn. Details are provided in 18 papers published in the open literature. Author (GRA)

N77-34024# City Coll. of the City Univ. of New York.
SOLID STATE OPTICS Final Report, 1 Jul. 1975 - 31 Dec. 1976
Melvin Lax 10 Mar. 1977 12 p refs
(Contract N00014-76-C-0099)
(AD-A041822) Avail: NTIS HC A02/MF A01 CSCL 20/12

Work on nonlinear interaction of light with antiferromagnetic materials, and thermoelastic materials is described. The Dirac Theory of Poisson brackets usually used to handle the constraint problem in electrodynamics has been applied to handle magnetic materials whose magnetization vector has a fixed length. A microscopic approach toward nonlinear optics has been started. This work reported here, provides a localized orbital estimate for nonlinear optical constants. The paraxial wave optics method with intensity and slope as the key variables avoids the rapid phase fluctuations that occur when field amplitudes are used as variables. A program to use equations for these variables to describe an unstable resonator with rectangular mirrors is being written. The spatial distribution of the temperature rise in a solid induced by a Gaussian laser beam of width w and power P is expressed as a one dimensional integral. GRA

N77-34025# Eagle-Picher Industries, Inc., Miami, Okla.
PURIFICATION, CONTROLLED DOPING AND CRYSTAL GROWTH OF II-VI COMPOUND SEMICONDUCTORS Final Report, 1 Dec. 1974 - 30 Nov. 1976
George N. Webb Apr. 1977 37 p
(Contract F33615-73-C-4013)
(AD-A041753; AFWL-TR-77-39) Avail: NTIS HC A03/MF A01 CSCL 20/12

The synthesis of various ultra high purity compounds of the II-VI group of semiconductor materials is described and tables of analytical data for each are included. The level of impurity concentration in synthesized ZnSe has been significantly lowered. The growth of crystals of II-VI compounds from the melt in the pressure furnace is reported. Included are data concerning doping of melt grown crystals with various amounts of selected impurities. The overall quality of the melt grown ZnSe has been improved. GRA

N77-34026# Connecticut Univ., Storrs.
ELECTRON-DISLOCATION INTERACTION AT LOW TEMPERATURES Progress Report
1976 19 p refs
(Contract EY-76-S-02-2305)
(COO-2305-4) Avail: NTIS HC A02/MF A01

Studies made of the interaction of mobile dislocations with electrons showed that dislocation motion can be described by treating the dislocation as an underdamped oscillator. Studies in lead alloys showed that dislocation motion can be considered as the motion of string, slightly damped by electrons, without regard for any other lattice friction. It was shown that silver solutes in lead crystal occupy, partially, interstitial sites. Dislocations in copper interact unexpectedly with electrons. This is shown by measuring the influence of a magnetic field on the flow stress of copper crystals at 4.2 K. ERA

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer*.

N77-34027 Rice Univ., Houston, Tex.
SPECIAL RELATIVITY AND THE CONVENTIONALITY OF SIMULTANEITY Ph.D. Thesis
Klaus Dieter Thoma 1977 173 p
Avail: Univ. Microfilms Order No. 77-20173

The concept of intrasystematic simultaneity of distant events is considered. The non-empirical nature of the concept of intra-systematic simultaneity is generally attributed to the fact that distant clocks must be physically synchronized before one way velocities can be measured. Since all such synchronization procedures have traditionally been thought to involve interpoint signalling processes all criteria for establishing distant simultaneity seemed to be based upon logically circular reasoning. The aim of this essay is to dispel this notion of a fundamental circularity inherent in the concept of intra-systematic simultaneity. Several logically independent synchronization methods are discussed which do not already presuppose prior knowledge of one way velocities. Hence the concepts of intra-systematic simultaneity and one-way velocity are vindicated as non-circular, empirically meaningful, and no more than trivially 'conventional'. Dissert. Abstr.

N77-34028# Ballistic Research Labs., Aberdeen Proving Ground, Md.
ON THE UNITS OF THE EQUILIBRIUM CONSTANT Final Report
J. M. Heimerl Jun. 1977 12 p refs
(AD-A041953; BRL-MR-2758) Avail: NTIS HC A02/MF A01 CSCL 20/13

A straightforward explicit derivation of the equilibrium constant is presented together with a discussion of the dimensional relationships that exist among equilibrium constants commonly used. Author (GRA)

N77-34029# Centre National de la Recherche Scientifique, Marseilles (France).
DYNAMICS OF CONTINUA AND PARTICLES FROM GENERAL COVARIANCE OF NEWTONIAN GRAVITATION THEORY
C. Duval and H. P. Kunzle Jul. 1976 32 p
(CNRS-CPT-76-P-849) Avail: NTIS (US Sales Only) HC A03/MF A01; ERDA Depository Libraries

The principle of general covariance, which states that the total action functional in General Relativity is independent of coordinate transformations, is shown to be also applicable to the four-dimensional geometric theory of Newtonian gravitation. It leads to the correct conservation (or balance) equations of continuum mechanics as well as the equations of motion of test particles in a gravitational field. The degeneracy of the 'metric' of Newtonian space-time forces to introduce a 'gauge field' which fixes the connection and leads to a conserved current, the mass flow. The particle equations are also derived from an invariant Hamiltonian structure on the extended Galilei group and a minimal interaction principle. One not only finds the same equations of motion but even the same gauge fields. ERA

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N77-34030# Perceptronics, Inc., Woodland Hills, Calif.
AN INTERACTIVE COMPUTER AIDING SYSTEM FOR GROUP DECISION MAKING
Steven Levin, Antonio Leal, and Joseph Saleh 27 Jun. 1977 112 p refs
(Contract MDA903-77-C-0184; ARPA Order 3344)
(AD-A041758; PQTR-1046-77-6) Avail: NTIS HC A06/MF A01 CSCL 09/2

This report describes progress on work centered on the demonstration of an interactive computer aid for group decision making. The report includes: (1) a preliminary description of the problem scenario that will be used in evaluating the aiding system, (2) the group/machine procedures and dialogues, (3) key algorithms in the elicitation program, (4) progress in installing and integrating computing and display resources. The next phase of the program will concentrate on the systems implementation and experimental evaluation. Author (GRA)

N77-34031# Michigan Univ., Ann Arbor.
INDUSTRIAL PRODUCTIVITY WORKSHOP EXECUTIVE SUMMARY
1 Mar. 1974 52 p Conf. held at Airlie, Virginia, 4-5 Feb. 1974
(Grant NSF GI-39924)
(PB-267299/6; NSF/RA/S-74-046) Avail: NTIS HC A04/MF A01 CSCL 05A

A closed workshop was held to solicit from industrial leaders an assessment of research required to enhance industrial productivity. Industries selected for study in the workshop were: (1) automotive; (2) electrical machinery; (3) machine tool; (4) household appliances; (5) food processing; (6) iron and steel. Productivity problems were assessed from the standpoint of their researchability with consideration being given to problem definition, quantification, measurement, and correlation of data necessary for scientific efforts. GRA

N77-34032# Naval Postgraduate School, Monterey, Calif.
AN APPLICATION OF MARKOVIAN CHAINS IN MANPOWER PLANNING M.S. Thesis

Rashad Abdulmohymen Abu-Alsamh Jun. 1977 87 p refs
(AD-A042304) Avail: NTIS HC A04/MF A01 CSCL 12/1

This thesis investigates the long run implications of short term policy making decisions. Manpower modeling techniques based on Markovian chains are applied to a small fast growing Navy organization. An interactive model is designed here to simulate policy changes and illustrate the interaction between flows, promotions and stocks, relative to a stable set of policy parameters over a period of time. Training and budget planning are addressed in some detail with a focus of the civilian population within the organization. Because real data is not available, the numerical examples are based on hypothetical data. The examples are presented to give the reader a feeling for how the model simulates various policy alternatives. Author (GRA)

N77-34033# Defense Systems Management School, Fort Belvoir, Va.

MAJOR SYSTEM ACQUISITION: IS A SEPARATE SPARES CONTRACT BETTER

Louis Keith Dumas May 1977 48 p refs
(AD-A042775) Avail: NTIS HC A03/MF A01 CSCL 15/5

This study seeks to focus attention on the support investment aspect of the weapon system acquisition process and to examine current views on the use of a separate spares contract for the initial provisioning and acquisition of spare/repair parts. The author contrasts historical and current approaches to contracting for initial spare/repair parts in support of aircraft acquisition programs. Historically, spare/repair parts have been provisioned by use of support element contract line items contained in the system production contract. Recently, separate spares contracts have been used to acquire spare/repair parts for major weapon systems such as the F-15, A-10, AWACS and the F-16. The purpose of this study is to describe differences between end item and spares line item relationships on conventional system contracts and separate spares contracts. The study reviews problems anticipated and encountered in contract separation, and reports current comments and evaluations regarding the effectiveness of separate spares contracts in achieving desired benefits. GRA

N77-34034# Defense Systems Management School, Fort Belvoir, Va.

IMPACT OF COMPETITIVE PROCUREMENT ON CONFIGURATION CONTROL

Fred Garza, Jr. May 1977 42 p refs
(AD-A042876) Avail: NTIS HC A03/MF A01 CSCL 05/1

This report seeks to provide insight into the configuration control problems that can occur after a competitive procurement. The author discusses the configuration control problems experienced by the 5-in./54 MK-45 Lightweight Gun System Program Office as a result of a competitive procurement. Specifically the problem areas include: Configuration identification, Change control and Configuration status accounting. The configuration control procedures formulated and implemented to correct the problems identified are also discussed. The report concludes with the lessons learned and makes appropriate recommendations. The lessons learned were that competitive procurement: (1) can have a significant impact on program configuration control; (2) impacts the production baseline; and (3) affects change control procedures and configuration status accounting. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N77-34035 Pittsburgh Univ., Pa.

THE DIVISION OF INFORMATION PROCESSING LABOR BETWEEN USER AND SUPPORT SYSTEM: EXPLORATION OF A CONCEPT Ph.D. Thesis

Charlene Kamila Robertson 1977 250 p
Avail: Univ. Microfilms Order No. 77-21237

The nature of one effective division of processing labor for an information system with support system-naive users is proposed. Such a division must: (1) be robust, i.e., have sufficient diagnostic and compensating devices to allow the user rapid recovery from errors (2) support the solution of the user's immediate problem with a sufficiently large knowledge base, or world view so that the user and system can converse about that world (e.g., that of toxicology); and (3) allow--indeed, help--the user to reconceptualize his information problem for the future. Finally, it is suggested that a method be developed whereby the system designer can specify all tasks in the system in an explicit way. Such a mechanism should be part of the theoretical models of information systems. It is further suggested that the models in their present form are more useful as taxonomies than as system diagrams, and that more precise terminology is required for the taxonomies to be a tool for system design. Dissert. Abstr.

N77-34036 Drexel Univ., Philadelphia, Pa.

COVERAGE OF JOURNAL ARTICLES BY SELECTED US DISCIPLINARY SCIENCE AND TECHNOLOGY ABSTRACTING AND INDEXING SERVICES AND ITS RELATIONSHIP TO OTHER CHARACTERISTICS OF THE SCIENTIFIC AND TECHNICAL LITERATURE, PARTICULARLY CITATIONS Ph.D. Thesis

Toni Carbo Bearman 1977 185 p
Avail: Univ. Microfilms Order No. 77-22525

Abstracting indexing services were explored as primary tools for identifying relevant reference material. From a sampling of journal articles, characteristics for selection were examined and analyzed using crosstabulations and frequency distributions. Findings of the study relate to characteristics of the literature, coverage by the abstracting and indexing services, and citations to the literature. Dissert. Abstr.

N77-34037 Indiana Univ., Bloomington.

PERCEIVED ENVIRONMENTAL UNCERTAINTY AND THE TWO-STEP FLOW PROCESS OF SCIENTIFIC AND TECHNICAL COMMUNICATION IN RESEARCH AND DEVELOPMENT LABORATORIES Ph.D. Thesis

James William Brown 1977 267 p
Avail: Univ. Microfilms Order No. 77-22595

The information diffusion process within research and development laboratories was examined. It was suggested by empirical studies from the fields of mass communication and diffusion of innovation that technical information follows a two step flow process. Information from the firm's environment is diffused into R and D labs via individuals called technological gatekeepers. Gatekeepers have broader contacts outside the firm and are sought out by their colleagues for technical advice. By having both internal and external communication attributes, gatekeepers are valuable in helping a firm meet environmental demands. The relationship between perceived environmental uncertainty and the existence of the gatekeeper phenomenon was emphasized. Dissert. Abstr.

N77-34038# Brookhaven National Lab., Upton, N. Y.

ARCHITECTURE OF THE BNL ARCHIVE AND DISSEMINATION SYSTEM

J. Heller Dec. 1976 61 p refs
(Contract EY-76-C-02-0016)
(BNL-22445) Avail: NTIS HC A04/MF A01

The broad specifications and desires of the BNLADS are discussed from the point of view that eventually this system will operate in a nonhomogeneous computer network. Then the nature of sequential files as dealt with by the BNLADS is considered. A data definition language (DDL) is specified that is capable of describing the access sequence, formatting, and logical names of the fields of data. This DDL is used by the system for accessing sequential files and formating data for output onto user specified files. The formal specification in Baccus Naur Form (BNF) is given with a discussion of the sematics of the DDL. The architecture of the BNLADS, i.e., the stratified organization, is examined. The version used is an intersection of the PL/I which is common to all manufacturers considered. ERA

N77-34039# Texas A&M Univ., College Station. Dept. of Industrial Engineering.

REVIEW POLICIES AND THEIR EFFECT ON JOURNAL QUALITY Final Technical Report, 1 Mar. - 1 Jul. 1976
Laurence L. George 31 Oct. 1976 33 p refs
(Grant NSF GDSI76-15422)
(PB-267602/1; I/EN-76/0017) Avail: NTIS HC A03/MF A01 CSCL 05B

A comparison was made of alternative ways to use referee recommendations in selection of articles to be published in a journal. Average submitted article quality and publication constraints were considered. Journals which are constrained to publish a small proportion of submitted articles have a lower total output quality than journals in more fortunate circumstances since the editor must reject so many articles that a signficant proportion of the readers would consider acceptable, while the possibility of publishing a relatively unacceptable article remains constant. GRA

N77-34040# National Bureau of Standards, Washington, D. C. Office of Standard Reference Data.
CRITICAL EVALUATION OF DATA IN THE PHYSICAL SCIENCES. A STATUS REPORT ON THE NATIONAL STANDARD REFERENCE DATA SYSTEM, JANUARY 1977
Stephen A. Rossmassler May 1977 88 p refs
(PB-268513/9; NBS-TN-947; LC-77-60016) Avail: NTIS HC A05/MF A01 CSCL 14B

Current activities and functions of the Office of Standard Reference Data are summarized. A complete list of data evaluation projects supported by the Office of Standard Reference Data during Fiscal Year 1977 is included; this list also includes projects which received financial support during the previous fiscal year, and which are still actively involved in some aspect of data compilation and evaluation. The list of projects includes continuing data centers in the United States whose activities fall within the scope of the system, but which are not formally affiliated with it. A list of publications resulting from the National Standard Reference Data program is provided. GRA

N77-34041# Advisory Group for Aerospace Research and Development, Paris (France).
SURVEY OF COMPUTER-ASSISTED WRITING AND EDITING SYSTEMS
P. I. Berman (Lockheed Electron. Co., Plainfield, N. J.) Jul. 1977 65 p refs
(AGARD-AG-229) Avail: NTIS HC A04/MF A01

The available technology for automating the preparation of technical and scientific documents was surveyed. The range of possibilities inherent in such technology was demonstrated by reviewing a number of typical system configurations. Present trends in automated publishing systems are suggested and some qualitative guidelines for selecting and implementing such systems are provided. Author

N77-34042# British Library Lending Div., Boston Spa (England). Research and Development Dept.
SHORT TERM EXPERIMENTAL INFORMATION NETWORK: REPORT TO THE EVALUATION SUBCOMMITTEE
Carole E. Wilmot Nov. 1975 103 p
(BLL-BLRDR-5369-(2113.56F)) Avail: British Library Lending Div., Boston Spa, Engl.

The British Library Research and Development Department began a program of research concerned with the use of computers for on-line information handling in 1973. The main task was an appraisal of on-line information retrieval systems through a co-operative research project involving a number of academic institutions in the UK. The project came to be known as the 'short term experimental informational project'. User reactions to the UK-based services - RETROSPEC I and SCISEARCH II - at six of the academic institutions are discussed. Author

N77-34043# British Library Lending Div., Boston Spa (England).
TRENDS IN SCHOLARLY PUBLISHING
Oct. 1976 94 p refs Workshop held at Leicester, England, 16-17 Jul. 1976
(BLL-BLRDR-5299-(2113.56F); ISBN-0-85350-141-6) Avail: British Library Lending Div., Boston Spa, Engl.: £3.50

Librarians, academics, publishers and booksellers were brought together to discuss the problems which beset academic publishing. Reports of specially commissioned research into trends in scholarly monograph publishing were studied. Trends in scholarly journal publishing and librarians' reactions to non-conventional publishing were cited. Also included are background papers on the publishing of scientific and technical journals in the USA, editorial processing centers and problems of small society publishers. Accounts of all the discussions are recorded. Author

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N77-34044*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A PREDICTION MODEL TO FORECAST THE COST IMPACT FROM A BREAK IN THE PRODUCTION SCHEDULE
Leon M. Delionback Sep. 1977 37 p refs
(NASA-TM-78131) Avail: NTIS HC A03/MF A01 CSCL 05C

The losses which are experienced after a break or stoppage in sequence of a production cycle portend an extremely complex situation and involve numerous variables, some of uncertain quantity and quality. There are no discrete formulas to define the losses during a gap in production. The techniques which are employed are therefore related to a prediction or forecast of the losses that take place, based on the conditions which exist in the production environment. Such parameters as learning curve slope, number of predecessor units, and length of time the production sequence is halted are utilized in formulating a prediction model. The pertinent current publications related to this subject are few in number, but are reviewed to provide an understanding of the problem. Example problems are illustrated together with appropriate trend curves to show the approach. Solved problems are also given to show the application of the models to actual cases or production breaks in the real world. Author

N77-34045# Decision Research Corp., Eugene, Oreg.
THE ART OF COST-BENEFIT ANALYSIS
Baruch Fischhoff Feb. 1977 62 p refs Prepared for Decisions and Designs, Inc., McLean, Va.
(Contract N00014-76-C-0074; ARPA Order 3052)
(AD-A041756; PRT-1042-77-2; DR-76-10) Avail: NTIS HC A04/MF A01 CSCL 14/1

This report provides a critical introduction to cost-benefit analysis. Particular attention is paid to the assumptions underlying such analyses, and the errors to which they are prone. A number of suggestions are raised for improving the analytic process and the contribution it makes to decision making. Author (GRA)

N77-34046# George Washington Univ., Washington, D. C. Program in Logistics.
THE STOCHASTIC FORMULATION OF A MODIFIED COBWEB MODEL
Barry D. Nussbaum and Nozer D. Singpurwalla 16 May 1977 28 p refs
(Contract N00014-75-C-0729)
(AD-A042737; Serial-T-352) Avail: NTIS HC A03/MF A01 CSCL 05/3

Much of the economic analysis done today employs either econometric models or autoprojective methods on series of data. This paper examines the connection between these two methods, and demonstrates how formulating an econometric model as a stochastic process can be useful. The basic economic cobweb model for price and quantity is used to generate an autoregressive process for the price series. Analyses are made of the speed with which price equilibrium is achieved. The familiar stability conditions are compared to the stationarity and invertibility conditions of a time series process. Forecast functions are derived, and an example is given to demonstrate how data can be tested to see if the underlying econometric mechanism is relevant.GRA

N77-34047# National Bureau of Standards, Washington, D. C. Experimental Technology Incentives Program.
LIFE CYCLE COSTING: CASE STUDIES Final Report
1 May 1977 112 p Prepared by General Services Admin.,

Federal Service Supply, and Logistics Management Inst., Washington, D.C.
(PB-268162/5; NBS-GCR-ETIP-77-37) Avail: NTIS HC A06/MF A01 CSCL 15E

The use of life cycle cost procurements of window air conditioners, water heaters, refrigerator-freezers, and high-speed printer ribbons made by the Federal Supply Service (FSS), General Services Administration (GSA) was studied. These procurements were part of a program instituted by FSS to apply life cycle costing techniques to its procurement process. Details concerning the screening process used in selecting the products, the preparation of the invitation for bid document, the bids received and the evaluation, analysis and award process were covered.
GRA

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

No abstracts in this category.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N77-34048*# Springborn Labs., Inc., Enfield, Conn.
WASH WATER WASTE PRETREATMENT SYSTEM Final Report, Jul. 1976 - Jun. 1977
Jun. 1977 66 p
(Contract NAS9-14965)
(NASA-CR-151513) Avail: NTIS HC A04/MF A01 CSCL 13B

Investigations were completed on wash waters based on each candidate personal cleansing agent. Evaluations of coagulants, antifoam agents, and the effect of promising antifoams on the chemical precipitation were included. Based on these evaluations two candidate soaps as well as their companion antifoam agents were selected for further work. Operating parameters included the effect of soap concentration, ferric chloride concentration, duration of mixing, and pore size of depth filters on the degree of soap removal. The effect of pressure on water flow through filter cartridges and on the rate of decline of water flow was also investigated. The culmination of the program was the recommendation of a pretreatment concept based on chemical precipitation followed by pressure filtration. Author

N77-34049*# National Aeronautics and Space Administration, Washington, D. C.
SPINOFF 1977: AN ANNUAL REPORT
James J. Haggerty Jan. 1977 117 p Original contains color illustrations
(NASA-TM-74908) Avail: NTIS MF A01; SOD HC $3.10 CSCL 05B

Direct and indirect benefits of space technology are reviewed. Applications in medicine, agriculture, solar energy technology, transportation, and other fields are discussed. JLH

N77-34050*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PRELIMINARY DESIGN STUDY OF A BASELINE MIUS
Barry M. Wolfer, Vernon E. Shields, James O. Rippey, Harmon L. Roberts, Richard C. Wadle, Steven P. Wallin, William L. Gill, E. H. White (Heimsath (Louis) Associates), and R. Monzingo (Boeing Co., Seattle, Wash.) Apr. 1977 262 p refs
(NASA-TM-X-58193; JSC-11625) Avail: NTIS HC A12/MF A01 CSCL 13B

Results of a conceptual design study to establish a baseline design for a modular integrated utility system (MIUS) are presented. The system concept developed a basis for evaluating possible projects to demonstrate an MIUS. For the baseline study, climate conditions for the Washington, D.C., area were used. The baseline design is for a high density apartment complex of 496 dwelling units with a planned full occupancy of approximately 1200 residents. Environmental considerations and regulations for the MIUS installation are discussed. Detailed cost data for the baseline MIUS are given together with those for design and operating variations under climate conditions typified by Las Vegas, Nevada, Houston, Texas, and Minneapolis, Minnesota. In addition, results of an investigation of size variation effects, for 300 and 1000 unit apartment complexes, are presented. Only conceptual aspects of the design are discussed. Results regarding energy savings and costs are intended only as trend information and for use in relative comparisons. Alternate heating, ventilation, and air conditioning concepts are considered in the appendix.
Author

N77-34051# Geraghty and Miller, Inc., Port Washington, N. Y.
PROCEDURES MANUAL FOR GROUND WATER MONITORING AT SOLID WASTE DISPOSAL FACILITIES
Dennis Fenn (Wehran Eng. Corp.), Eugene Cocozza (Wehran Eng. Corp.), John Isbister, Olin Braids, Bruce Yare, and Paul Roux Aug. 1977 284 p refs
(Contract EPA-68-01-3210)
(EPA-530/SW-611) Avail: NTIS HC A13/MF A01; EPA, Solid Waste Information, Cincinnati, Ohio 45268

Information valuable as a reference source for persons actively engaged in or planning ground water monitoring programs at solid waste disposal facilities is delineated. Since the implications for monitoring activities are clearly great, this imformation serves as a useful tool as state solid waste agencies proceed to strengthen their land protection programs. The manual is primarily addressed to the supervisory personnel of solid waste regulatory agencies, although its contents can be readily used by engineers in the field. It is offered as a guide to be used and tailored by the supervisory personnel at their discretion and guidance to persons without prior training or experience and will prove helpful to the operators and managers of solid waste disposal facilities who find a need for a familiarity with and understanding of the fundamental principles involved in ground water pollution and monitoring. Author

N77-34052# Integrated Enterprises, Inc., Huntsville, Ala.
APPROPRIATE TECHNOLOGY: A DIRECTORY OF ACTIVITIES AND PROJECTS
1977 75 p
(Grant NSF ERS-76-21350)
(PB-267970/2; NSF/RA-770064) Avail: NTIS HC A04/MF A01 CSCL 13B

A directory of United States activities in technology that incorporates a concern for maintenance of the ecological balance by increasing the use of renewable resources, extending recycling and diminishing waste, and fostering the resource independence of local areas is presented. The field was surveyed to learn from individuals and groups about the scope of their activities, the legal and technical problems they are facing in moving from idea to application, and their recommendations for federal activity in support of appropriate technology. The directory is, in part, a compilation of the descriptions of activities of the survey respondents. GRA

N77-34053# Defense Systems Management School, Fort Belvoir, Va.
NATO STANDARDIZATION VERSUS US DATA RELEASABILITY: AN APPROACH TO RESOLVING THE CONFLICT
George R. Winters, II May 1977 44 p refs
(AD-A042959) Avail: NTIS HC A03/MF A01 CSCL 05/1

The report delineates two chains of direction which can conflict in the program office. One chain supports the national policy goal of increasing the effectiveness of NATO by standardizing systems to achieve interoperability. The other chain supports the national policy goal of protecting U.S. security by restricting the transfer of data and technology. These national policies can

conflict in a program office if implementing NATO standardization requires release of vital U.S. data. The study describes how to achieve both goals: NATO standardization and protection of U.S. data. How depends on the particular situation, and the particular situation depends on two factors. One factor is the type of data which are involved: threat data, U.S. system capabilities/vulnerabilities, or technology. The other factor is the potential disclosee: NATO government, NATO industry, or non-NATO buying government. These factors can be arranged into a three-by-three matrix which results in nine general data - disclosee cases. For each general case, the report suggests possible strategies for avoiding or minimizing standardizations - releasability conflicts. The mechanisms involve alternate threat models, sanitized system engineering documents, use of Data Exchange Agreements, and the like. Emphasis is placed on early planning for NATO standardization impacts on a program and on adding foreign disclosure specialists and administrative security personnel to the program management team. Author (GRA)

N77-34054# Brookhaven National Lab., Upton, N. Y. Policy Analysis Div.

ANALYTICAL APPROACH TO THE DETERMINATION OF URBAN POPULATION DENSITY GRADIENTS AND ITS APPLICATION TO ENERGY PLANNING PROBLEMS

P. M. Meier and T. H. McCoy Oct. 1976 65 p refs
(Contract EY-76-C-02-0016)
(BNL-20916) Avail: NTIS HC A04/MF A01

Clark's hypothesis forms the basis for the model of population density to be used in this essay. A method of estimating the parameters of the model is presented with an analysis of error sensitivity. The difference between a uniform density specification for a given area and a density gradient formulation is examined, using a calculation of pollutant dose from a centrally located power station as an example. Extension of the model to urban areas of non-circular form is derived, again with emphasis on the estimation of model parameters. The traditional regression technique for parameter estimation is compared with the numerical method developed in this paper. Finally, the model is applied to a sample of energy planning problems, the screening of urban areas for suitability for district heating schemes, the computation of transportation costs in the recovery of energy from municipal refuse, and a preliminary formulation of a model of power plant location in urban areas. ERA

N77-34055# Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab.

DEVELOPMENT OF MICROWAVE PLASMA DETOXIFICATION PROCESS FOR HAZARDOUS WASTES, PHASE 1 Final Report

Lionel J. Bailin and Barry L. Hertzler Apr. 1977 82 p refs
(Contract EPA-68-03-2190)
(PB-268526/1; EPA-600/2-77-030) Avail: NTIS HC A05/MF A01 CSCL 14B

A recent, successful, R&D effort is described in which a former grams per hour system was scaled up to a five to seven pounds per hour system, and then its performance was verified with several typical hazardous materials. The materials tested and detoxified were Malathion, methyl-bromide, polychlorinated biphenyls, phenylmercuric acetate, and Kepone. Complete detoxification resulted. Further benefits of the process are the competitive, reasonable costs of about $0.20 per pound of material processed, including all costs. GRA

N77-34056# Boise Center for Urban Research, Idaho.

REGIONAL DATA CENTER Final Report

Basil Dahlstrom Mar. 1977 88 p refs Sponsored in part by National League of Cities/US Conference of Mayors, Washington, D. C.
(Contract HUD-H-2196R)
(PB-268883/6; UO-LCCM-BOI-77-008; HUD/RES-1094) Avail: NTIS HC A05/MF A01 CSCL 13B

Cooperative projects were identified and promoted among local governments within the ADA/Canyon county region. A land use file of the Boise Metropolitan area reflecting the land use status in 1975 was constructed. A system of producing and maintaining high quality parcel maps for Ada County was devised. Local government agencies within Ada County have proceeded to establish cooperative efforts to provide land use and map information on an on-going basis. GRA

N77-34057# Gruen Associates, Los Angeles, Calif.

LAND USE AND ARTERIAL SPACING IN SUBURBAN AREAS

Frederick C. Pearson and George C. Schoener May 1977 76 p refs
(Contracts DOT-FH-11-8746; DOT-FH-11-7876)
(PB-269353/9; FHWA/PL-77/016) Avail: NTIS HC A05/MF A01 CSCL 13B

Guidelines for correlating arterial street systems with development patterns and densities in representative suburban areas are provided. The guidelines supplement conventional methods of traffic forecasting and circulation planning in cases where technical resources are limited or quick estimates for alternative development proposals are needed. Guidelines are given to relate areawide suburban development densities per-mile traffic volumes, and arterial street system lanes and spacing. Supplemental charts provide areawide adjustment factors for different project size and density combinations, level of traffic service, transit utilization, and car ownership. GRA

N77-34058# Little (Arthur D.), Inc., Cambridge, Mass.

EVALUATION OF THE DISPOSAL OF FLUE GAS DESULFURIZATION WASTES IN MINES AND THE OCEAN: INITIAL ASSESSMENT Progress Report, Jul. 1975 - Jul. 1976

R. R. Lunt, C. B. Cooper, S. L. Johnson, J. E. Oberholtzer, G. R. Schimke, and W. I. Watson May 1977 318 p refs
(Contract EPA-68-03-2334)
(PB-269270/5; EPA-600/7-77-051) Avail: NTIS HC A14/MF A01 CSCL 13B

Environmental, technical, regulatory, and economic aspects of the use of disposal sites were evaluated. Available data on chemical and physical properties of both treated and untreated sludges generated in ongoing environmental and privately funded sludge characterization programs were also collected and summarized. GRA

N77-34059# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.

ACCESSIBILITY APPLICATIONS IN URBAN TRANSPORTATION Final Report, Jan. 1976 - Jan. 1977

Robert Jay Popper and Michael David Jan. 1977 54 p refs
(PB-269240/8; UMTA-VA-11-0002-77-2) Avail: NTIS HC A04/MF A01 CSCL 13B

The theory and methodology for developing accessibility studies to evaluate transportation service impacts at the corridor, subarea or metropolitan levels are outlined. A computer program (Metropolitan Accessibility Program or MAP) is described that facilitates such an analysis. In addition a typical case study application is presented illustrating how employment accessibility is modified in a corridor after the building of a high speed transit line. Data indicates the relative degree to which the Black population subgroup in the corridor benefits from the accessibility improvements. The program is suggested for use in planning and evaluation studies. GRA

N77-34060# Texas A&M Univ., College Station. Dept. of Civil Engineering.

BACHMAN TREATMENT FACILITY FOR EXCESSIVE STORM FLOW IN SANITARY SEWERS Final Report

Harold W. Wolf Jul. 1977 147 p refs Prepared for Dallas Water Utilities Dept., Tex.
(PB-269128/5; EPA-600/2-77-128) Avail: NTIS HC A07/MF A01 CSCL 13B

Facility was built in Dallas, Texas, to provide physical-chemical treatment to those municipal wastewater flows that during periods of heavy precipitation exceed the capacity of a downstream interceptor. The treatments provided in the facility include the addition of waste lime sludge from a nearby water purification plant, flocculation, sedimentation, tube settling, and chlorination. The facility was operated primarily to determine the benefits that might be derived from the addition of potable water treatment plant waste sludges to these excess flows.GRA

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N77-34061*# Foster (John) and Associates, Inc., Los Altos, Calif.
POINT SOURCE DETECTION IN INFRARED ASTRONOMICAL SURVEYS
Robert F. Pelzmann, Jr. 20 Mar. 1977 74 p
(Contract NAS2-9432)
(NASA-CR-152004) Avail: NTIS HC A04/MF A01 CSCL 03A

Data processing techniques useful for infrared astronomy data analysis systems are reported. This investigation is restricted to consideration of data from space-based telescope systems operating as survey instruments. In this report the theoretical background for specific point-source detection schemes is completed, and the development of specific algorithms and software for the broad range of requirements is begun. Author

N77-34062*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A PHOTOMETRIC STUDY OF THE ORION OB 1 ASSOCIATION. 3: SUBGROUP ANALYSES
Wayne H. Warren, Jr. and James E. Hesser (Cerro Tololo Inter-Am. Obs.) Oct. 1977 231 p refs Submitted for publication
(Contract NSF C-866)
(NASA-TM-X-71407; X-680-77-251) Avail: NTIS HC A11/MF A01 CSCL 03A

The four principal subgroups of the association were examined in detail using individual distances and reddening values determined for their B type members. Subgroup 1a appeared not to show a spread in age nor did it show a systematic distance increase with right ascension when fainter members were considered. An eastwardly increase in distance was found for subgroup 1b but the reddening law for the east Belt appeared normal. Small subclusterings in the vicinity of the Orion Nebula appeared not to differ in the evolutionary state but their ages were considerably greater than those of stars in the nebulae and its associated cluster. Author

N77-34063*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RECOGNITION OF COMPACT ASTROPHYSICAL OBJECTS
H. Ogelman, ed. and R. Rothschild, ed. 1977 200 p refs
(NASA-SP-421) Avail: NTIS HC A09/MF A01 CSCL 03A

NASA's Laboratory for High Energy Astrophysics and the Dept. of Physics and Astrophysics at the Univ. of Md. collaborated on a graduate level course with this title. This publication is an edited version of notes used as the course text. Topics include stellar evolution, pulsars, binary stars, X-ray signatures, gamma ray sources, and temporal analysis of X-ray data. J.L.H.

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N77-34064 Fordham Univ., New York.
COSMOLOGY AND THE STRUCTURE OF SCIENTIFIC THEORY Ph.D. Thesis
John Joseph Moder SM 1977 157 p
Avail: Univ. Microfilms Order No. 77-20580

Some of these philosophical implications of Suppe's alternative view of scientific theories are considered. Of special interest with respect to the classical epistemological problems is Suppe's treatment of the instrumentalism-realism controversy. His notion of empirical truth, a generalization of factual truth to allow for counterfactuals, permits him to argue for a modified realism. This development is seen as an important contribution, although unresolved problems with regard to counterfactuals still require attention. Finally, the significance of cosmology as a fundamental physical theory presupposed by local physical theories is argued. This foundational function of cosmology suggests that it is not only another branch of science but an especially important test case for the analysis of the structure of scientific theories.
Dissert. Abstr.

N77-34065*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERPLANETARY MEDIUM DATA BOOK
Joseph H. King Sep. 1977 388 p refs
(NASA-TM-X-72614; NSSDC/WDC-A-R/S-77-04) Avail: NTIS HC A17/MF A01 CSCL 03B

Unresolved questions on the physics of solar wind and its effects on magnetospheric processes and cosmic ray propagation were addressed with hourly averaged interplanetary plasma and magnetic field data. This composite data set is described with its content and extent, sources, limits of validity, and the mutual consistency studies and normalizations to which the input data were subjected. Hourly averaged parameters were presented in the form of digital listings and 27-day plots. The listings are contained in a separately bound appendix. Author

N77-34066*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERPLANETARY MEDIUM DATA BOOK, APPENDIX
Joseph H. King Sep. 1977 506 p
(NASA-TM-X-72615; NSSDC/WDC-A-R/S-77-04a) Avail: NTIS HC A22/MF A01 CSCL 03B

Computer generated listings of hourly average interplanetary plasma and magnetic field parameters are given. Parameters include proton temperature, proton density, bulk speed, an identifier of the source of the plasma data for the hour, average magnetic field magnitude and cartesian components of the magnetic field. Also included are longitude and latitude angles of the vector made up of the average field components, a vector standard deviation and an identifier of the source of magnetic field data. Author

N77-34067*# Dudley Observatory, Albany, N.Y.
ICE IN SPACE: AN EXPERIMENTAL AND THEORETICAL INVESTIGATION Final Report
Harvey Patashnick and Georg Rupprecht 1 Aug. 1977 191 p refs
(Contract NAS8-30566)
(NASA-CR-150417) Avail: NTIS HC A09/MF A01 CSCL 03B

Basic knowledge is provided on the behavior of ice and ice particles under a wide variety of conditions including those of interplanetary space. This information and, in particular, the lifetime of ice particles as a function of solar distance is an absolute requirement for a proper interpretation of photometric profiles in comets. Because fundamental properties of ice and ice particles are developed in this report, the applicability of this information extends beyond the realm of comets into any area where volatile particles exist, be it in space or in the earth's atmosphere.
Author

N77-34068*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HELIOCENTRIC DISTANCE DEPENDENCE OF THE INTERPLANETARY MAGNETIC FIELD
Kenneth W. Behannon Jul. 1977 92 p refs
(NASA-TM-X-71398; X-692-77-196) Avail: NTIS HC A05/MF A01 CSCL 03B

Recent and ongoing planetary missions have provided extensive observations of the variations of the Interplanetary Magnetic Field (IMF) both in time and with heliocentric distance from the sun. Large time variations in both the IMF and its fluctuations were observed. These are produced predominantly by dynamical processes in the interplanetary medium associated

with stream interactions. Magnetic field variations near the sun are propagated to greater heliocentric distances, also contributing to the observed variablity of the IMF. Temporal variations on a time-scale comparable to or less than the corotation period complicate attempts to deduce radial gradients of the field and its fluctuations from the various observations. However, recent measurements inward to 0.46 AU and outward to 5 AU suggest that the radial component of the field on average decreases approximately as r to the minus second power, while the azimuthal component decreases more rapidly than the r to the minum first power dependence predicted by simple theory. This, and other observations, are discussed. Author

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N77-34069*# Science Applications, Inc., Pasadena, Calif. Planetary Science Inst.
MARTIAN POLAR GEOLOGICAL STUDIES Final Report
James A. J. Cutts 25 Jul. 1977 21 p refs
(Contract NASw-2885)
(NASA-CR-155160) Avail: NTIS HC A02/MF A01 CSCL 03B

Multiple arcs of rugged mountains and adjacent plains on the surface of Mars were examined. These features, located in the southern polar region were photographed by Mariner 9. Comparisons are made with characteristics of a lunar basin and mare; Mare imbrium in particular. The martian feature is interpreted to have originated in the same way as its lunar analog- by volcanic flooding of a large impact basin. Key data and methodology leading to this conclusion are cited. Author

N77-34070*# Science Applications, Inc., Pasadena, Calif. Planetary Science Inst.
GEOLOGIC INVESTIGATION OF MERCURY DATA AND THE SUBSEQUENT MAPPING AND EXPLANATION OF THE QUADRANGLE AREA H-12 Final Report
Karl R. Blasius 15 Aug. 1977 18 p refs
(Contract NASw-2900)
(NASA-CR-155159) Avail: NTIS HC A02/MF A01 CSCL 03B

The origin of scraps and ridges mapped in the H-12 region of Mercury are discussed. These features apparently are of non-impact origin and show distinctly non-random patterns of distribution and orientation. These patterns cannot be simply related to selective enhancement of visibility by lighting conditions, global stresses of spin down or interior cooling, or local uplifts or subsidences. Suggestions are made that the origin of these structures may lie outside the region of Mercury photographed or the scarps and ridges may have formed by reactivation of faults or joints bounding pre-existing crystal blocks. Author

N77-34071*# Science Applications, Inc., Schaumburg, Ill.
ADVANCED PLANETARY STUDIES Annual Report
Jul. 1977 104 p refs
(Contract NASw-2893)
(NASA-CR-155054; AR-4; SAI-1-120-580-A4) Avail: NTIS HC A06/MF A01 CSCL 03B

Results of planetary advanced studies and planning support are summarized. The scope of analyses includes cost estimation research, planetary mission performance, penetrator advanced studies, Mercury mission transport requirements, definition of super solar electric propulsion/solar sail mission discriminators, and advanced planning activities. Author

N77-34072*# Science Applications, Inc., Rolling Meadows, Ill.
ADVANCED PLANETARY STUDIES Annaul Report
Mar. 1976 87 p refs
(Contract NASw-2783)
(NASA-CR-155055; AR-3; SAI-1-120-399-A3) Avail: NTIS HC A05/MF A01 CSCL 03B

Results of planetary advanced studies and planning support are summarized. The scope of analyses includes cost estimation research, planetary mission performance, penetrator mission concepts for airless planets/satellites, geology orbiter payload adaptability, lunar mission performance, and advanced planning activities. Study reports and related publications are included in a bibliography section. Author

N77-34073*# Science Applications, Inc., Pasadena, Calif.
GEOLOGY ORBITER COMPARISON STUDY
James A. J. Cutts, Karl R. Blasius, Donald R. Davis, Kevin D. Pang, and David C. Shreve Aug. 1977 137 p refs
(Contract NASw-2613)
(NASA-CR-155056; SAI-1-120-399-S1) Avail: NTIS HC A07/MF A01 CSCL 03B

Instrument requirements of planetary geology orbiters were examined with the objective of determining the feasibility of applying standard instrument designs to a host of terrestrial targets. Within the basic discipline area of geochemistry, gamma-ray, X-ray fluorescence, and atomic spectroscopy remote sensing techniques were considered. Within the discipline area of geophysics, the complementary techniques of gravimetry and radar were studied. Experiments using these techniques were analyzed for comparison at the Moon, Mercury, Mars and the Galilean satellites. On the basis of these comparative assessments, the adaptability of each sensing technique was judged as a basic technique for many targets, as a single instrument applied to many targets, as a single instrument used in different mission modes, and as an instrument capability for nongeoscience objectives. Author

N77-34074*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
REPORT OF THE TERRESTRIAL BODIES SCIENCE WORKING GROUP. VOLUME 1: EXECUTIVE SUMMARY
15 Sep. 1977 32 p 9 Vol.
(Contract NAS7-100)
(NASA-CR-155189; JPL-Pub-77-51-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 03B

Current knowledge of Mercury, Venus, Mars, the Moon, asteroids, comets, and the Galilean satellites were reviewed along with related NASA programs and available mission concepts. Exploration plans for the 1980 to 1990 period are outlined and recommendations made. Topics discussed include: scientific objectives and goals, exploration strategy and recommended mission plans, supporting research and technology, Earth-based and Earth-orbital investigations, data analysis and synthesis, analysis of extraterrestrial materials, broadening the science support base, and international cooperation. A.R.H.

N77-34075*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
REPORT OF THE TERRESTRIAL BODIES SCIENCE WORKING GROUP. VOLUME 2: MERCURY
A. L. Albee, F. V. Coroniti, M. C. Malin, and C. P. Sonett 15 Sep. 1977 29 p refs 9 Vol.
(Contract NAS7-100)
(NASA-CR-155188; JPL-Pub-77-51-Vol-2) Avail: NTIS HC A03/MF A01 CSCL 03B

The objectives and rationale for scientific investigation of Mercury are explored. Knowledge already obtained by astronomical observations and Mariner 10 spacecraft is reviewed and measurements required for the principal scientific goals are described. The use of low thrust propulsion systems is recommended so that maximum scientific return may be achieved and the reconnaissance phase of Mercury exploration may be completed in a single mission. Accelerated development is recommended on solar electric propulsion, solar sails, passive and active cooling mechanisms, and single rough landers. A.R.H.

N77-34076*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
REPORT OF THE TERRESTRIAL BODIES SCIENCE WORKING GROUP. VOLUME 3: VENUS
W. M. Kaula, M. C. Malin, H. Masursky, G. Pettengill, R. Prinn, and R. E. Young 15 Sep. 1977 33 p 9 Vol.
(Contract NAS7-100)
(NASA-CR-155187; JPL-Pub-77-51-Vol-3) Avail: NTIS HC A03/MF A01 CSCL 03B

The science objectives of Pioneer Venus and future investigations of the planet are discussed. Concepts and payloads for proposed missions and the supporting research and technology required to obtain the desired measurements from space and Earth-based observations are examined, as well as mission priorities and schedules. A.R.H.

N77-34077*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
REPORT OF THE TERRESTRIAL BODIES SCIENCE WORKING GROUP. VOLUME 4: THE MOON
L. A. Haskin, M. B. Duke, N. Hubbard, T. V. Johnson, M. C. Malin, and J. Minear 15 Sep. 1977 44 p refs 9 Vol.
(Contract NAS7-100)
(NASA-CR-155186; JPL-Pub-77-51-Vol-4) Avail: NTIS HC A03/MF A01 CSCL 03B

A rationale for furture exploration of the moon is given. Topics discussed include the objectives of the lunar polar orbiter mission, the mission profile, and general characteristics of the spacraft to be used. A.R.H.

N77-34078*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
REPORT OF THE TERRESTRIAL BODIES SCIENCE WORKING GROUP. VOLUME 5: MARS
H. Masursky, A. L. Albee, G. Briggs, M. B. Duke, J. W. Schopf, L. Soderblom, C. P. Sonett, I. Stewart, J. L. Trombka, and J. Wood 15 Sep. 1977 54 p 9 Vol.
(Contract NAS7-100)
(NASA-CR-155185; JPL-Pub-77-51-Vol-5) Avail: NTIS HC A04/MF A01 CSCL 03B

Present knowledge of the global properties and surface characteraretics of Mars and the composition and dynamics of its atmosphere are reviewed. The objectives of proposed missions, the exploration strategy, and supporting research and technology required are delineated. A.R.H.

N77-34079*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
REPORT OF THE TERRESTRIAL BODIES SCIENCE WORKING GROUP. VOLUME 6: THE ASTEROIDS
C. R. Chapman, T. V. Johnson, and T. B. McCord 15 Sep. 1977 19 p 9 Vol.
(Contract NAS7-100)
(NASA-CR-155184; JPL-Pub-77-51-Vol-6) Avail: NTIS HC A02/MF A01 CSCL 03B

Earth-based astronomical observations and laboratory analysis of meteorites provide the only scientific data available on asteroids. These data are summarized and subjects for future investigations are explored. The measurements required for potential missions are discussed and concepts for a multi-asteroid rendezvous mission in the mid-1980's are outlined. A.R.H.

N77-34080*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
REPORT OF THE TERRESTRIAL BODIES SCIENCE WORKING GROUP. VOLUME 7: THE GALILEAN SATELLITES
F. P. Fanale, J. C. Beckman, C. R. Chapman, F. V. Coroniti, T. V. Johnson, and M. C. Malin 15 Sep. 1977 32 p 9 Vol.
(Contract NAS7-100)
(NASA-CR-155183; JPL-Pub-77-51-Vol-7) Avail: NTIS HC A03/MF A01 CSCL 03B

The formational and evolutionary history of natural satellites, their mineralogical composition and other phenomena of scientific interest are discussed. Key scientific questions about IO, Ganymede, Callisto, and Europa are posed and the measurements and instruments required for a Galilean satellite lander in the 1980's are described. A.R.H.

N77-34081*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
REPORT OF THE TERRESTRIAL BODIES SCIENCE WORKING GROUP. VOLUME 8: THE COMETS
J. C. Brandt, C. R. Chapman, and F. P. Fanale 15 Sep. 1977 19 p refs 9 Vol.
(Contract NAS7-100)
(NASA-CR-155181; JPL-Pub-77-51-Vol-8) Avail: NTIS HC A02/MF A01 CSCL 03B

The determination of the nuclear and atmospheric properties of comets, and the interaction of the solar wind with the comet tail are scientific objectives for a mission to one or more comets in the next decade. Recommended priorities for direct cometary exploration are listed. A.R.H.

N77-34082*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
REPORT OF THE TERRESTRIAL BODIES SCIENCE WORKING GROUP. VOLUME 9: COMPLEMENTARY RESEARCH AND DEVELOPMENT
F. P. Fanale, W. M. Kaula, T. B. McCord, and J. L. Trombka 15 Sep. 1977 31 p 9 Vol.
(Contract NAS7-100)
(NASA-CR-155181; JPL-Pub-77-51-Vol-9) Avail: NTIS HC A03/MF A01 CSCL 03B

Topics discussed include the need for: the conception and development of a wide spectrum of experiments, instruments, and vehicles in order to derive the proper return from an exploration program; the effective use of alternative methods of data acquisition involving ground-based, airborne and near Earth orbital techniques to supplement spacraft mission; and continued reduction and analysis of existing data including laboratory and theoretical studies in order to benefit fully from experiments and to build on the past programs toward a logical and efficient exploration of the solar system. Author

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N77-34083*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
STEREOSCOPIC DIRECTION FINDING ANALYSIS OF A TYPE III SOLAR RADIO BURST: EVIDENCE FOR EMISSION AT TWICE THE PLASMA FREQUENCY Progress Report
D. A. Gurnett, M. M. Baumback, and H. Rosenbauer (Max-Planck-Inst. fuer Extraterrest. Phys., Garching, West Ger.) Apr. 1977 40 p refs Submitted for publication
(Contracts NAS5-11431; NAS1-13129; NAS-5-11279; Grant NGL-16-001-043; Contract N00014-76-C-0016)
(NASA-CR-155176; U-of-Iowa-77-13; AD-A038822) Avail: NTIS HC A03/MF A01 CSCL 03/2

Stereoscopic direction finding measurements from the IMP 8, Hawkeye 1 and Helios 2 spacecraft over baseline distances of a substantial fraction of an A.U. are used to directly determine the three-dimensional trajectory of a type III solar radio burst. By comparing the observed source positions with the direct in situ solar wind plasma density measurements obtained by Helios 1 and 2 near the sun the relationship of the emission frequency to the local plasma frequency can be determined directly without any modeling assumptions. These comparisons show that the type III radio emission occurs near the second harmonic, of the local electron plasma frequency. Other characteristics of the type III radio emission, such as the source size, which can be obtained from this type of analysis are also discussed. GRA

N77-34084*# Maryland Univ., College Park. Dept. of Physics and Astronomy.
CHARGE STATES OF LOW ENERGY IONS FROM THE SUN Ph.D. Thesis
Richard Kevin Sciambi Dec. 1975 110 p refs
(Contract NAS5-11063)
(NASA-CR-152586; TR-76-092) Avail: NTIS HC A06/MF A01 CSCL 03B

Measurements of ionization states and energy spectra of carbon, oxygen, and iron accelerated in ten solar flare particle events are reported, for energies between 15 keV per nucleon and 600 keV per nucleon. The ionization states were remarkably constant from flare to flare, despite great variations in other event parameters. The mean ionization state for carbon was 5.7, for oxygen 6.2, and for iron 11.7, values which are similar to the respective ionization states in the solar wind. The time profile of the He/[C+N+O] ratio was examined, and it was found that the ratio was small early in the event, and increased with time. The energy spectra of the medium ions showed a flattening below 100 keV per nucleon, which was highly correlated with event size as measured by the event averaged flux of 130 to 220 keV protons. Author

N77-34085*# Michigan Univ., Ann Arbor. Radio Astronomy Observatory.
THE 2-8 GHz SOLAR DYNAMIC SPECTRA AND POLARIZATION MEASUREMENT FEASIBILITY STUDY Final Report, Nov. 1970 - Feb. 1971
Fred T. Haddock Feb. 1971 172 p refs
(Contract NAS5-11344)
(NASA-CR-152604) Avail: NTIS HC A08/MF A01 CSCL 03B

The preliminary system design of a Solar Microwave Spectrograph (SMS) is presented. This design resulted from a study to determine the feasibility of measuring solar polarization and dynamic spectra over the range of two to eight GHz, using broadband radio frequency instrumentation and rapid recording equipment in conjunction with radio telescopes. The scientific value of the proposed SMS instrument is discussed, with remarks concerning data reduction and analysis and a presentation of the engineering plan to implement the SMS system. Author

N77-34086# Spectra Optics, Sylmar, Calif.
EPHEMERAL ACTIVE REGIONS DURING THE SOLAR MINIMUM. 1: GENERAL PROPERTIES AND TRENDS OVER THE SOLAR CYCLE. 2: CHARACTERISTICS OF INDIVIDUAL EPHEMERAL REGIONS Final Report, 1 Oct. 1975 - 30 Sep. 1976
Sara F. Martin and Karen L. Harvey 28 Dec. 1976 58 p refs
(Contract F19628-76-C-0081)
(AD-A038124; AFGL-TR-76-0255) Avail: NTIS HC A04/MF A01 CSCL 03/2

General properties of ephemeral active regions were studied using Kitt Peak daily magnetograms from Apr. - Nov. 1975. Although this interval was prior to sunspot minimum, ephemeral regions related to incoming cycle 21 were already more numerous than ephemeral regions related to outgoing cycle 20. The transition between the old and new solar cycle was identified by a reversal of the statistically dominant orientation of regions and sometimes by a minimum in the latitude distribution where adjacent cycles overlapped. During this interval the transition between cycle 20 and 21 was at N18 deg and S24 deg. Comparing this 1975 data with previously studied data from 1970 and 1973, we find evidence that incoming cycle 21 was already present on the sun at middle and high latitudes in 1973 and 1970. Extrapolating backward and forward in time from these three periods, we find that it is conceivable that two solar cycles may be present on the sun at all times. It appears that further statistical studies of ephemeral active regions may yield long-term prognostic information on the future course of solar activity. The birth of 90 ephemeral regions was recorded. Prior to the birth of regions, existing network was found to disappear or show lateral displacement. The growth and decay rates of regions were comparable. In the decaying phase, some flux elements simply disappeared; some merged with network or other elements of regions of similar polarity; some collided and simultaneously disappeared with network or elements of other regions of opposite polarity. All clearly identifiable ephemeral regions dissipated by these processes while continuing to expand. GRA

N77-34087# Air Force Geophysics Lab., Hanscom AFB, Mass.
POLARIZATION SPECTRA OF CENTIMETER WAVELENGTH SOLAR BURSTS USING WHOLE-SUN OBSERVATIONS
Donald A. Guidice 8 Dec. 1976 37 p refs
(AD-A038782; AFGL-TR-76-0295) Avail: NTIS HC A03/MF A01 CSCL 03/2

The physics of microwave-burst emission is briefly examined to give the rationale for investigating polarization spectra. The instruments used to carry out the 9.4 GHz and 7 GHz circular-polarization measurements and the 5 GHz Stokes-parameter measurements are described. A survey of the August 1972 to December 1973 period produced a table of 45 bursts, from which some limited results were obtained. About 75 to 80 percent of all bursts are circularly polarized, with varying polarization over the 5 to 9.4 GHz range. For most bursts where the circular polarization pc increases toward the upper or lower end of the 5 to 9.4 GHz range, the total intensity I also increases in that direction. The few bursts having a pc sense reversal in the 5 to 9.4 GHz range also have a spectral maximum of I at roughly the same frequency. Some simplified explanations of the results are presented. GRA

N77-34088# Harvard Coll. Observatory, Cambridge, Mass.
RESEARCH STUDY ON DYNAMICS OF THE SOLAR ATMOSPHERE Final Report, 1 Jul. 1974 - 30 Sep. 1976
Barbara Bell Oct. 1976 23 p
(Contract F19628-75-C-0016)
(AD-A035939; AFGL-TR-76-0267) Avail: NTIS HC A02/MF A01 CSCL 03/2

The first section summarizes the theoretical studies carried out on loop prominences as current loops rather than magnetic lines of force, and on problems connected with the general theory of relativity. The latter studies lead to the conclusion, among others, that Black Holes are a mathematical fiction, impossible of physical existence. The following section deals with research in the general area of solar-terrestrial relations, one investigation directly in this area and the other, climate history, having at present only a potential for linkage to solar activity, and receiving only minor support from this contract. The former, begun under the predecessor contract, explores the relations between the intensity of coronal FeXV emission, the level of geomagnetic activity, and the velocity of the solar wind, and was completed and published during the period of this contract. GRA

N77-34089# European Space Agency, Paris (France).
MEDIUM ENERGY CHARGED PARTICLE SPECTROMETER. EXPERIMENT E8 HELIOS
Erhard Keppler, Berend Wilken, Klaus Richter, Gerhard Umlauft, Klaus Fischer, and Hans-Peter Winterhoff Sep. 1977 193 p refs Transl. into ENGLISH of 'Ein Spektrometer fuer geladene Teilchen mittlerer Energien. Expt E8 Helios', Max-Planck-Inst. fuer Aeronomie, Lindau, West Ger. Report BMFT-FB-W-76-14, Oct. 1976 Original report in GERMAN previously announced as N77-23445 Original German report available from ZLDI, Munich DM 43.05
(ESA-TT-390; BMFT-FB-W-76-14) Avail: NTIS HC A09/MF A01

The charged particle spectrometer E8 onboard Helios A and B is described. The experiment covers proton energies from 80 keV to 6 MeV, electron energies from 20 keV to 2 MeV, and positron energies from 150 to 550 keV. Flight performance is discussed, and selected examples are used to demonstrate the instrument's properties. Author (ESA)

N77-34090# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 392. PART 1: PROMPT REPORTS Report, Mar. - Feb. 1977
Helen E. Coffey, ed. Apr. 1977 107 p
(PB-268660/8; SGD-392-Pt-1; NOAA-7705 1805) Avail: NTIS HC A06/MF A01 CSCL 03B

Data are provided for March 1977 regarding: alert periods, daily solar indices, solar flares, solar radio waves, solar X-ray radiation coronal holes, inferred IP magnetic field polarities, mean solar magnetic field and solar wind measurements. Data is also provided for February 1977 on: daily solar activity center, sudden ionospheric disturbances, solar radio waves, cosmic rays, geomagnetic indices and radio propagation indices. GRA

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N77-34091*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOURCES OF MAGNETIC FIELDS IN RECURRENT INTERPLANETARY STREAMS
L. F. Burlaga, K. W. Behannon, S. F. Hansen (Natl. Center for Atmospheric Res.), G. W. Pneuman (Natl. Center for Atmospheric Res.), and W. C. Feldman (LASL) Sep. 1977 45 p refs Submitted for publication

(NASA-TM-X-71400; X-692-77-213) Avail: NTIS HC A03/MF A01 CSCL 03B

The sources of magnetic fields in recurrent streams were examined. Most fields and plasmas at 1 AU were related to coronal holes, and the magnetic field lines were open in those holes. Some of the magnetic fields and plasmas were related to open field line regions on the sun which were not associated with known coronal holes, indicating that open field lines are more basic than coronal holes as sources of the solar wind. Magnetic field intensities in five equatorial coronal holes ranged from 2G to 18G. Average measured photospheric magnetic fields along the footprints of the corresponding unipolar fields on circular equatorial arcs at 2.5 solar radii had a similar range and average, but in two cases the intensities were approximately three times higher than the projected intensities. The coronal footprints of the sector boundaries on the source surface at 2.5 solar radii, meandered between -45 deg and +45 deg latitude, and their inclination ranged from near zero to near ninety degrees. Author

N77-34092*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE X-RAY EMITTING GALAXY CEN-A

R. F. Mushotzky, P. J. Serlemitsos, R. H. Becker (Md. Univ., College Park), E. A. Boldt, and S. S. Holt Oct. 1977 28 p refs Submitted for publication

(NASA-TM-X-71402; X-661-77-237) Avail: NTIS HC A03/MF A01 CSCL 03B

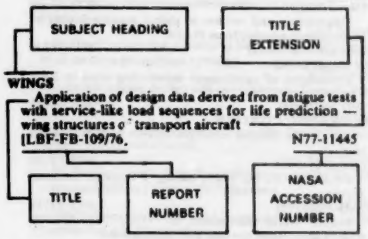
OSO-8 X-ray observations of Cen-A in 1975 and 1976 are reported. The source spectrum is well fit in both years by a power law of number index 1.62 and absorption due to 1.3 x 10 to the 23rd power at/sq cm. The total flux varied by a factor 2 between 1975 and 1976. In 1975 there were approximately 40% flux variations on a time scale of days. The 6.4 keV Fe fluorescent line and the 7.1 keV absorption edge were measured implying Fe/H approximately equals .000016. Simultaneous radio measurements show variation in phase with X-ray variability. Models considering radio, milimeter, IR and X-ray data show that all the data can be accounted for by a model in which the X-rays are due to a synchrotron self-Compton source embedded in a cold H(2) cloud. Author

99 GENERAL

No abstracts in this category.

SUBJECT INDEX

Typical Subject Index Listing



The subject heading is the key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The NASA accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus* (NASA SP-7050).

A

A-37 AIRCRAFT
A-37B fatigue sensor evaluation program: Full scale test and field aircraft instrumentation
[AD-A042114] N77-33156

ABERRATION
Cytogenetic studies of blood, experiment M111
N77-33804

ABRASION RESISTANCE
Abrasion resistance of safety lenses. Effects of abrasion on toughened safety glass and plastic lenses with respect to their optical properties
[PB-267399/4] N77-33367

ABSORPTION SPECTRA
CL XI nozzle F2 absorption experiment
[AD-A041566] N77-33515

ABSORPTIVITY
Relations among Kubelka-Munk coefficients and absorption and scattering coefficients of powders
[AD-A041110] N77-33300

ABSTRACTS
Literature review of the remote sensing of natural resources — bibliography
[NASA-CR-155190] N77-33551
Coverage of journal articles by selected US disciplinary science and technology abstracting and indexing services and its relationship to other characteristics of the scientific and technical literature, particularly citations
N77-34036

AC GENERATORS
Subsystem design analysis light weight alternator [model test program]. Addendum 2
[AD-A041257] N77-33171

ACCELERATED LIFE TESTS
Accelerated mission test: A vital reliability tool
N77-33196

ACCELERATION
Trapping and detrapping in a single wave and particle acceleration in a magnetoplasma
[IPPJ-263] N77-33980

ACCURACY
Ultraprecise parabolic interpolator for numerically controlled machine tools
[REPT-40004] N77-33529

ACCELERATION STRESSES (PHYSIOLOGY)
Lower body negative pressure: Third manned Skylab mission
N77-33809
Vectorcardiographic results from Skylab medical experiment M092: Lower body negative pressure
N77-33810
Hemodynamic studies of the legs under weightlessness
N77-33811
Lower body negative pressure device
N77-33821
Vestibular-visual interactions in flight simulators
[NASA-CR-153200] N77-33847

ACCELERATION TOLERANCE
Response of the cardiovascular system to vibration and combined streases
[AD-A039000] N77-33848

ACCELEROMETERS
Studies of orbital Eoetvoes experiments
[NASA-CR-155193] N77-33226

ACCIDENT INVESTIGATION
Evaluation methodology for federal motor vehicle safety standards. Volume 2: Technical findings
[PB-266937/2] N77-33382
PROMETHEUS 2: A user oriented program for human crash dynamics
[PB-269305/9] N77-33866

ACETATES
Abrasion resistance of safety lenses. Effects of abrasion on toughened safety glass and plastic lenses with respect to their optical properties
[PB-267399/4] N77-33367

ACETYLACETONE
Polymerization of methyl methacrylate initiated by t-butyl hydroperoxide in the presence of metal acetylacetonates
N77-33338

ACETYLENE
The integrated infrared intensities of the fundamental vibrations of acetylene, acetylene d2 and effective charges
N77-33280

ACIDS
Study of the auxiliaries for lead-acid battery systems for peaking power
[CONS/2114-3] N77-33634

ACOUSTIC ATTENUATION
A research program to reduce interior noise in general aviation airplanes. Design of an acoustic panel test facility
[NASA-CR-155152] N77-33957
A research to reduce interior noise in general aviation airplanes. General aviation interior noise study
[NASA-CR-155153] N77-33958
A research program to reduce interior noise in general aviation airplanes — test methods and results
[NASA-CR-155154] N77-33959
Frequency dependence of impulse noise attenuation — hazard to hearing
[AD-A042031] N77-33961

ACOUSTIC DUCTS
Analytical and experimental studies of acoustic performance of segmented liners in a compressor inlet
[NASA-CR-2882] N77-33960

ACOUSTIC MEASUREMENTS
Analytical and experimental studies of acoustic performance of segmented liners in a compressor inlet
[NASA-CR-2882] N77-33960

ACOUSTIC PROPAGATION
Reciprocal acoustic transmission in a mid-ocean environment
N77-33955

ACOUSTIC PROPERTIES
Acoustic emission monitoring of crack propagation on the expedited wing fatigue test article X993
[AD-A041107] N77-33540

ACRYLIC ACID
The surface chemistry of acrylic polymer colloids
N77-33345

ACRYLIC RESINS
Polymerization of methyl methacrylate initiated by t-butyl hydroperoxide in the presence of metal acetylacetonates
N77-33338

ADAPTATION
Task and work performance on Skylab missions 2, 3, and 4: Time and motion study: Experiment M151
N77-33796
Crew efficiency on first exposure to zero-gravity
N77-33797

ADAPTIVE CONTROL
F-8C adaptive flight control laws
[NASA-CR-2880] N77-33202
F-8C adaptive flight control extensions — for maximum likelihood estimation
[NASA-CR-2881] N77-33203
High angle of attack flight control using stochastic model reference adaptive control
[AD-A041436] N77-33897
A method of adaptive smoothing and edge enhancement — for image processing
[AD-A041909] N77-33898

ADDITIVES
Protection of nomex from ultraviolet degradation
[AD-A041494] N77-33358

ADHESIVE BONDING
Primary Adhesively Bonded Structure Technology [PABST]. Phase 1B: Preliminary design
[AD-A041536] N77-33354
Basic adhesion mechanisms in thick and thin films
[AD-A041959] N77-33366
Investigation of coating compounds and adhesives for self-supporting collapsible fuel storage tanks
[AD-A042653] N77-33369

ADHESIVES
Development of low cost, high reliability sealing techniques for hybrid microcircuit packages, phase 2
[NASA-CR-150420] N77-33349

ADIABATIC CONDITIONS
Problems related to macroscopic electric fields in the magnetosphere
[TRITA-EPP-77-08] N77-33736
Formation and adiabatic compression of reversed-field theta pinches in imploding liners
[AD-A041737] N77-34007

ADJOINTS
Calculation of reference orbits by solving selfadjoint boundary value problem
[SER-C/DISS-228] N77-33228

ADSORPTION
Statistics of chain molecules between two adsorbing surfaces
N77-33277
Temperature programmed exchange studies of supported metal catalysts
N77-33281
Hydrogen solubility in rare earth intermetallic compounds
N77-33288
Oscillatory indirect interaction between adsorbed atoms
[AD-A042376] N77-33967

AERIAL RECONNAISSANCE
An analysis of personnel parachutes for use by Marine Corps Force Reconnaissance Units
[AD-A041151] N77-33124

AERODYNAMIC CHARACTERISTICS
Subsonic longitudinal aerodynamic characteristics and engine pressure distributions for an aircraft with an integrated scramjet designed for Mach 6 cruise — conducted in Langley 7 by 10 foot high speed tunnel
[NASA-TM-X-73911] N77-33108
Prediction of static aerodynamic characteristics for slender bodies alone and with lifting surfaces to very high angles of attack
[NASA-TR-R-474] N77-33110
Theoretical parametric study of the relative advantages of winglets and wing-tip extensions
[NASA-TP-1020] N77-33112
The effect of flight on the noise of subsonic jets
[AD-A041730] N77-33176
Wing rock as a lateral-directional aircraft limit cycle oscillation induced by nonlinear aerodynamics occurring at high angle of attack
[AD-A042104] N77-33204
Results of a landing gear loads test using a 0.0405-scale model [16-0] of the space shuttle orbiter in the Rockwell International NAAL wind tunnel [OA163B], volume 1
[NASA-CR-151370] N77-33253

AERODYNAMIC CONFIGURATIONS
Spin-tunnel investigation of the spinning characteristics of typical single-engine general aviation airplane designs. 1. Low-wing model A: Effects of tail configurations
[NASA-TP-1009] N77-33111
Over-the-wing model thrust reverser noise tests
[NASA-TM-73495] N77-33161
Consistency in aircraft structural and flight control analysis
N77-33213

AERODYNAMIC FORCES
Unsteady supersonic aerodynamic theory for interfering surfaces by the method of potential gradient
[NASA-CR-2898] N77-33121
Airplane math modeling methods for active control design
N77-33212
Results of a landing gear loads test using a 0.0405-scale model [16-0] of the space shuttle orbiter in the Rockwell International NAAL wind tunnel [OA163B], volume 2
[NASA-CR-151371] N77-33254
AERODYNAMIC STABILITY
Stability and control of ground effect aircraft in longitudinal motion
[AD-A042005] N77-33205
Rotorcraft flight simulation with coupled rotor aeroelastic stability analysis. Volume 1: Engineer's manual
[AD-A042462] N77-33207
Entry dynamics of space shuttle orbiter with longitudinal stability and control uncertainties at supersonic and hypersonic speeds
[NASA-TP-1084] N77-33259
AERODYNAMICS
Initial unsteady aerodynamic measurements of a circulation controlled airfoil and an oscillating flow wind tunnel
[AD-A042102] N77-33122
Fundamental aerodynamic study of local injection in a turbulent boundary layer
[ESA-TT-412] N77-33127
AEROELASTICITY
Nonlinear aeroelastic equations for combined flapwise bending, chordwise bending, torsion, and extension of twisted nonuniform rotor blades in forward flight
[NASA-TM-74059] N77-33107
Rotorcraft flight simulation with coupled rotor aeroelastic stability analysis. Volume 1: Engineer's manual
[AD-A042462] N77-33207
Wind energy conversion
[PB-268718/4] N77-33667
AERONAUTICAL ENGINEERING
Sophistication and reliability --- of modern materials for aircraft
N77-33191
Technology requirements for advanced earth-orbital transportation systems: Summary report --- single stage to orbit vehicles
[NASA-CR-2867] N77-33255
AEROSOLS
Mission definition for the first flight of a multidisciplinary lidar system formulated following discussions with representatives of various institutes
[DLR-IB-553-76/4] N77-33513
Chemical-analytical techniques for aerosols
[BNL-22440] N77-33690
Determination of sulfur speciation in industrial aerosols in an SO2 rich environment
[COO-2988-1] N77-33692
Particle size distribution of nitrate aerosols in the Los Angeles air basin
[PB-269349/7] N77-33703
Description and review of global measurements of atmospheric species from GASP
[NASA-TM-73781] N77-33720
Multidisciplinary lidar system in Spacelab for application to atmospheric physics and remote sensing --- aerosols and trace gases
[ESA-TT-404] N77-33739
AEROSPACE ENGINEERING
Report of the Terrestrial Bodies Science Working Group. Volume 9: Complementary research and development
[NASA-CR-155181] N77-34082
AEROSPACE MEDICINE
Hemodynamic studies of the legs under weightlessness
N77-33811
Anthropometric changes and fluid shifts
N77-33812
Vectorcardiographic changes during extended space flight [M093]: Observations at rest and during exercise
N77-33813
Effect of prolonged space flight on cardiac function and dimensions
N77-33815
Results of Skylab medical experiment M171-metabolic activity
N77-33816
Metabolic cost of extravehicular activities
N77-33818
Skylab: A beginning
N77-33820
Automatic blood pressure measuring system [M092]
N77-33823
A.I.e. in-flight blood collection system
N77-33825
In-flight medical support system
N77-33832
Translation on USSR science and technology biomedical sciences, no. 9
[JPRS-69899] N77-33841
Translations on USSR science and technology biomedical sciences, no. 10
[JPRS-69924] N77-33842
Space Biology and Aerospace Medicine, no. 4, 1977
[JPRS-69964] N77-33843
Neurophysiological estimates of human performance capabilities in aerospace systems
[AD-A038208] N77-33849
Bibliography of research reports and publications: Impact, vibration, windblast and escape, 1942 - 1976
[AD-A042201] N77-33850
AEROSPACE TECHNOLOGY TRANSFER
The Role of Aerospace Technology in Agriculture. The 1977 Summer Faculty Fellowship Program in Engineering Systems Design
[NASA-CR-145218] N77-33580
Spinoff 1977: An annual report
[NASA-TM-74908] N77-34049
AFRICA
The application of ERTS imagery to the FAO/Unesco soil map of the world
[E77-10236] N77-33567
Satellite inferred surface albedo over northwestern Africa
[PB-267835/7] N77-33740
AGING [BIOLOGY]
Biological solar energy conversion: Approaches to overcome yield, stability and product limitations
[PB-267937/1] N77-33619
AGRICULTURE
Notes on the pollution of airplanes and helicopters by chemicals during agricultural jobs
[NASA-TT-F-17444] N77-33129
Seismotectonic, structural, volcanologic, and geomorphic study of New Zealand; indigenous forest assessment in New Zealand; mapping, land use, and environmental studies in New Zealand, volume 1
[E77-10233] N77-33564
Applied Remote Sensing Program [ARSP] — Apache, Yavapai, Graham, and Yuma countries, Arizona
[E77-10240] N77-33571
Investigation of environmental change pattern in Japan. Observation of present state of agricultural land-use by analysing LANDSAT data
[E77-10243] N77-33574
The Role of Aerospace Technology in Agriculture. The 1977 Summer Faculty Fellowship Program in Engineering Systems Design
[NASA-CR-145218] N77-33580
Retention of selected physiological indicators in pilots in the course of agricultural flights
[NASA-TT-F-17441] N77-33845
AIR
Moisture distribution modification by upward vertical motion
[PB-268740/8] N77-33763
AIR CARGO
Technical and economic assessment of swept-wing span-distributed load concepts for civil and military air cargo transports
[NASA-CR-145229] N77-33147
AIR CONDITIONING
Early use of solar energy in buildings. A study of barriers and incentives to the widespread use of solar heating and cooling systems
[PB-267832/4] N77-33618
Strategies for commercializing customer thermal-energy storage
[ANL-ES-55] N77-33649
AIR DEFENSE
Aggregated shorads attrition weapon deck — subroutine libraries [computers]
[AD-A040390] N77-33242
AIR INTAKES
Exploratory study of turbulence in air intakes
[AAAF-NT-77-17] N77-33471
AIR MASSES
Analysis of cool season lake-related mesoscale phenomena using numerical variational analysis
[PB-269619/3] N77-33771
AIR POLLUTION
Notes on the pollution of airplanes and helicopters by chemicals during agricultural jobs
[NASA-TT-F-17444] N77-33129
Development of air-monitoring techniques using solid sorbents. LASL Project R-059, NIOSH-IA-77-12
[LA-6738-PR] N77-33693
Considerations on air pollution propagation from aircraft
[DLR-IB-553-75/6] N77-33698
Reliability study of vapor recovery systems at service stations
[PB-267613/8] N77-33700
Evaluation of continuous monitoring sites in EPA Region 6
[PB-269223/4] N77-33701
Evaluation of stationary source particulate measurement methods. Volume 2: Oil-fired steam generators
[PB-269081/6] N77-33705
Methods used to estimate air pollutant emissions 1974, 1980, and 2000. New Jersey, New York: Connecticut air quality control region
[PB-269667/2] N77-33706
Atmospheric dispersion characteristics in the Louisiana coastal zone
[AD-A041099] N77-33747
AIR QUALITY
SKETCHMOD: A policy-oriented modeling process for air quality management
N77-33682
Monitoring air quality with lichen: A feasibility study
[NP-21650] N77-33689
Description and review of global measurements of atmospheric species from GASP
[NASA-TM-73781] N77-33720
AIR SAMPLING
Evaluation of continuous monitoring sites in EPA Region 6
[PB-269223/4] N77-33701
AIR TRAFFIC CONTROL
Air traffic control experimentation and evaluation test
[AD-A041971] N77-33136
Requirements for flight testing automated terminal service
[AD-A041975] N77-33137
Monte Carlo simulation of VOR/DME holding procedures. Basic notions and applications
[ESA-TT-419] N77-33142
AIR TRANSPORTATION
The development of a model for predicting passenger acceptance of short-haul air transportation systems
[NASA-CR-145250] N77-33148
AIR WATER INTERACTIONS
Meteorological forcing fields of the New York bight
[PB-269442/0] N77-33774
AIRBORNE EQUIPMENT
Measurements of the influence of static and dynamic interference on an ILS-receiver and measurement of the capture effect with the double frequency procedure
[TUBS/SFB58/50] N77-33140
Multidisciplinary lidar system in Spacelab for application to atmospheric physics and remote sensing --- aerosols and trace gases
[ESA-TT-404] N77-33739
AIRCRAFT
Stability and control of ground effect aircraft in longitudinal motion
[AD-A042005] N77-33205
AIRCRAFT ACCIDENTS
Analysis of air accidents involving airplanes or helicopters of various types of application
[NASA-TT-F-17443] N77-33128
Aircraft accident report. Midair collision. Reeds Aviation, Inc., Piper PA-28R-200, N7941C, and Piper-28-181, N8592C, near Huntsville, Missouri, 24 July 1976
[NTISUB/C/104-002] N77-33133
Testing simulation of damages occurred in service
N77-33194
AIRCRAFT ANTENNAS
Interaction of a rectangular ferrite slab with magnetic fields
[AD-A041944] N77-33386
AIRCRAFT COMPARTMENTS
A research program to reduce interior noise in general aviation airplanes — test methods and results
[NASA-CR-155154] N77-33959
AIRCRAFT CONSTRUCTION MATERIALS
Sophistication and reliability --- of modern materials for aircraft
N77-33191
AIRCRAFT CONTROL
Digital flight control systems
[NASA-CR-145246] N77-33200
F-8C adaptive flight control laws
[NASA-CR-2880] N77-33202
F-8C adaptive flight control extensions --- for maximum likelihood estimation
[NASA-CR-2881] N77-33203
Structural Aspects of Active Controls
[AGARD-CP-228] N77-33208
A practical optimum selection procedure for a motivator in active flutter suppression system design on an aircraft with underwing stores
N77-33209
Impact of a command and stability augmentation system on gust response of a combat aircraft
N77-33210
Airplane math modeling methods for active control design
N77-33212
Consistency in aircraft structural and flight control analysis
N77-33213
YC-14 control system redundancy
N77-33214
AIRCRAFT DESIGN
Spin-tunnel investigation of the spinning characteristics of typical single-engine general aviation airplane designs. 1. Low-wing model A: Effects of tail configurations
[NASA-TP-1009] N77-33111

Modeling and parameter uncertainties for aircraft flight control system design
[NASA-CR-2887] N77-33149
Human factors engineering considerations in designing Naval aircraft for maintainability
[AD-A041156] N77-33153

AIRCRAFT ENGINES
Power plant reliability
[AGARD-CP-215] N77-33181
Civil airworthiness requirements for powerplant reliability N77-33185
Risks affecting the structural resistance and integrity of modern propulsion systems N77-33187
Aircraft engine design and development through lessons learned N77-33190
Progress in determining service life by endurance tests — Concorde aircraft N77-33195
Methods of improving the performance reliability of advanced military power plant systems N77-33198
Preliminary results of USAF experience with engine monitoring and diagnostics N77-33199
Considerations on air pollution propagation from aircraft
[DLR-IB-553-75/6] N77-33698

AIRCRAFT EQUIPMENT
Master monitor display application study for F-14
[AD-A041570] N77-33158

AIRCRAFT FUELS
Estimation of net enthalpies of combustion of some aviation fuels expressed in the international system of units [SI]
[NBS-TN-937] N77-33370

AIRCRAFT LANDING
Longitudinal handling qualities during approach and landing of a powered lift STOL aircraft
[NASA-TM-X-62144] N77-33151

AIRCRAFT MAINTENANCE
Product improvement program evaluation
[AD-A042134] N77-33101
Human factors engineering considerations in designing Naval aircraft for maintainability
[AD-A041156] N77-33153
Maintenance methods for improving propulsion system reliability N77-33184

AIRCRAFT MANEUVERS
Transonic wind-tunnel investigation of the maneuver potential of the NASA supercritical wing concept, phase I
[NASA-TM-X-3534] N77-33115
Retention of selected physiological indicators in pilots in the course of agricultural flights
[NASA-TT-F-17441] N77-33845

AIRCRAFT NOISE
Aircraft sideline noise: A technical review and analysis of comtemporary data
[AD-A042076] N77-33685
Further sensitivity studies of community-aircraft noise exposure [NOISEMAP] prediction procedures
[AD-A041781] N77-33686
Airplane noise: Dimensions and means of noise reduction — in Norway
[ELAB-STF44-A75080] N77-33696
Methods for the electronic simulation of flight sounds
[NASA-TT-F-17432] N77-33956

AIRCRAFT PARTS
Investigation of an aluminum rolling helix crash energy absorber
[AD-A042084] N77-33132

AIRCRAFT PERFORMANCE
Flight evaluation of an advanced technology light twin-engine airplane [ATLIT]
[NASA-CR-2832] N77-33104

AIRCRAFT RELIABILITY
Power plant reliability
[AGARD-CP-215] N77-33181
Maintenance methods for improving propulsion system reliability N77-33184
Civil airworthiness requirements for powerplant reliability N77-33185
Reliability versus cost in operating wide body jet engines N77-33186
Risks affecting the structural resistance and integrity of modern propulsion systems N77-33187
Development procedures to promote reliability N77-33188
CFM56 turbofan maintainability and reliability-oriented development N77-33189
Aircraft engine design and development through lessons learned N77-33190
Sophistication and reliability — of modern materials for aircraft N77-33191
The evolution and control of different performance degradation processes in modern propulsion systems -- monitoring jet engines N77-33193

AIRCRAFT SAFETY
Bird strike hazards: A bibliography, 1971 - 1976
[NAL-BIBL-SER-77] N77-33131

AIRCRAFT SPECIFICATIONS
Consistency in aircraft structural and flight control analysis N77-33213

AIRCRAFT SURVIVABILITY
Physical vulnerability of aircraft due to fluid dynamic effects
[AGARD-AR-106] N77-33478

AIRCRAFT TIRES
Behavior of aircraft antiskid breaking systems on dry and wet runway surfaces: A slip-ratio-controlled system with ground speed reference from unbraked nose wheel
[NASA-TN-D-8455] N77-33150

AIRCRAFT WAKES
Vortex interactions and decay in aircraft wakes
[NASA-CR-2870] N77-33105

AIRFOILS
Flight evaluation of an advanced technology light twin-engine airplane [ATLIT]
[NASA-CR-2832] N77-33104
Initial unsteady aerodynamic measurements of a circulation controlled airfoil and an oscillating flow wind tunnel
[AD-A042102] N77-33122

AIRFRAMES
Wind tunnel and analytical investigation of over-the-wing propulsion/air frame interferences for a short-haul aircraft at Mach numbers from 0.6 to 0.78 -- conducted in the Lewis 8 by 6 foot tunnel
[NASA-CR-2905] N77-33114
Computations in turbulent flows and off-design performance predictions for airframe-integrated scramjets
[NASA-CR-155053] N77-33438

AIRPORTS
A-37B fatigue sensor evaluation program: Full scale test and field aircraft instrumentation
[AD-A042114] N77-33156
Aircraft sideline noise: A technical review and analysis of comtemporary data
[AD-A042076] N77-33685

AIRSPEED
A suspended anemometer system for measuring true airspeed on low-speed airplanes
[NASA-TN-D-8523] N77-33157

ALBEDO
Satellite inferred surface albedo over northwestern Africa
[PB-267835/7] N77-33740

ALGORITHMS
Minimum time acceleration of aircraft turbofan engines by using an algorithm based on nonlinear programming
[NASA-TM-73741] N77-33167
Reduced state viterbi detector demonstration
[AD-A041712] N77-33396
Time division multiplex frame synchronization: Acquisition, maintenance and reacquisition
[AD-A041384] N77-33435
Regular multivalued functions and algorithmic applications N77-33904
CSKYTI: An out-of-core Cholesky algorithm equation solver [with respect to profile] for the Texas Instruments' Advanced Scientific computer
[AD-A042807] N77-33923
An algorithm for minimizing a differentiable function subject to box constraints and errors
[AD-A042916] N77-33924
Stochastic approximation algorithms for the sequential Monte Carlo optimization of stochastic systems N77-33928

ALKALI HALIDES
Mass filtering and velocity analysis of products of single collision reactions of barium with alkali halides N77-33282

ALKALI METAL COMPOUNDS
Burner rig alkali salt corrosion of several high temperature alloys
[NASA-TM-X-73659] N77-33313

ALKENES
The understanding of molecular properties by both experimental and theoretical methods: The localized molecular orbitals of transition metal complexes, and the ionization potentials of n-alkenes N77-33284

ALLOCATIONS
Analysis and forecast of electrical distribution system materials. Volume 3: Appendix
[CONS/2050-1-VOL-3-APP] N77-33430

ALLOYS
Role of stress effects in the oxidation behavior of high temperature alloys
[CONF-761057-4] N77-33333
Computer technology in materials analysis. Part 1: Metals and alloys
[AD-A041031] N77-33877

ALPHANUMERIC CHARACTERS
A review of the literature on the legibility of alphanumerics on electronic displays
[AD-A040625] N77-33856

ALTERNATIONS
K-area boiler-turbine alternator. Validation tests and validation project
[BNWL-2168] N77-33653

ALTIMETERS
Calibration results for the GEOS-3 altimeter
[NASA-CR-141430] N77-33261

ALUMINUM
Corrosion behavior of aluminum in water
[Y-DA-7055] N77-33334
High speed foil breakers
[UCRL-TRANS-11226] N77-33428
Performance of branch circuit electrical terminations of copper and aluminum non-metallic sheathed cable
[PB-267221/0] N77-33434
Instrumentation for automatic cycling of lithium-aluminum/iron sulfide secondary cells
[ANL-76-119] N77-33633

ALUMINUM ALLOYS
Investigation of an aluminum rolling helix crash energy absorber
[AD-A042084] N77-33132
Lockalloy Be-38Al material characterization, 1976 year-end report
[AD-A041284] N77-33271
A study of constituent, dispersoid, and hardening particles in the fracture of 7075 aluminum alloys
[AD-A041421] N77-33319
Cathodic kinetics during corrosion of 5456-H117 aluminum alloy by high velocity sea water
[AD-A041218] N77-33320
Cathodic kinetics during corrosion of 5456-H117 aluminum alloy by high velocity sea water
[AD-A041724] N77-33324
Investigation of metal processing operations
[AD-A042188] N77-33326

ALUMINUM BORON COMPOSITES
Air bonded, FOD resistant metal matrix fan blades
[AD-A041492] N77-33170

ALUMINUM OXIDES
Mullite phase equilibria in the system: CaO-Al2O3-SiO2
[LBL-5706] N77-33329
Sintering of Al2O3 powder compact by hot stage scanning electron microscopy
[LBL-5763] N77-33330
Pressureless sintering of SiAlon gas turbine components
[AD-A041207] N77-33353

AMINO ACIDS
The corrosion kinetics of copper in aqueous amino acid and carboxylic acid solutions N77-33312
Higher plant metabolism and energetics in hypogravity: Amino acid metabolism in higher plants
[NASA-CR-155198] N77-33840

AMMUNITION
A safety, quality and cost effectiveness study of composition A3 press loading parameters,2
[AD-A041078] N77-33383

AMPLITUDE MODULATION
Computer simulations on the nonlinear frequency shift and nonlinear modulation of ion-acoustic waves
[IPPJ-266] N77-33983
Experimental study on self-modulation of ion plasma oscillations
[IPPJ-280] N77-33995

ANALYSIS [MATHEMATICS]
New capabilities of Walsh functions and Walsh transforms
[AD-A041748] N77-33916

ANALYSIS OF VARIANCE
Minimax subset selection with applications to unequal variance problems
[AD-A041744] N77-33917

ANALYZERS
A portable residual stress analyzer
[AD-A041831] N77-33542

ANELASTICITY
Nonlinear anelastic behavior of a synthetic rubber at finite strains
[AD-A041777] N77-33363

ANEMOMETERS
A suspended anemometer system for measuring true airspeed on low-speed airplanes
[NASA-TN-D-8523] N77-33157

ANGLE OF ATTACK
Prediction of static aerodynamic characteristics for slender bodies alone and with lifting surfaces to very high angles of attack
[NASA-TR-R-474] N77-33110
Wing rock as a lateral-directional aircraft limit cycle oscillation induced by nonlinear aerodynamics occurring at high angle of attack
[AD-A042104] N77-33204
High angle of attack flight control using stochastic model reference adaptive control
[AD-A041436] N77-33897

ANGULAR VELOCITY
An accurate angular position and angular velocity instrument based on an optical incremental encoder
[WRE-TN-1730(WR/D)] N77-33480
ANIONS
Collisional dissociation and structural properties of atmospheric negative ions
[AD-A042111] N77-33730
ANISOTROPY
Intermetallic compounds containing lanthanides [studies of magnetic anisotropy]
[AD-A041947] N77-34023
ANNUAL VARIATIONS
A comparison of the frequency distribution of four-hour totals of manually digitized radar data with flooding over a portion of the Southeastern United States
[PB-268872/9] N77-33760
ANODES
The coulometric dissolution and electrochemical behavior of titanium anodes in methanol
N77-33276
ANOMALIES
The shapes of marine magnetic anomalies: Paleomagnetic field behavior, paleomagnetic poles and ridge crest processes
N77-33716
A study of the intermediate and long wavelength gravity field of the worlds oceans
N77-33777
ANTENNA DESIGN
AAFE large deployable antenna development program: Executive summary
[N...SA-CR-2894] N77-33260
Millimeter-wave antenna design
[NASA-CR-152608] N77-33409
ANTENNA RADIATION PATTERNS
The theory of diffraction by a perfectly conducting wedge of arbitrary angle applied to antenna patterns
[ESA-TT-416] N77-33401
ANTENNAS
Analysis of wire antennas in the presence of a conducting half space. Part 3: The buried antenna
[UCRL-52228] N77-33400
ANTHROPOMETRY
Anthropometric changes and fluid shifts
N77-33812
ANTIFERROMAGNETISM
Solid state optics
[AD-A041822] N77-34024
ANTISKID DEVICES
Behavior of aircraft antiskid breaking systems on dry and wet runway surfaces: A slip-ratio-controlled system with ground speed reference from unbraked nose wheel
[NASA-TN-D-8455] N77-33150
APPROACH CONTROL
Longitudinal handling qualities during approach and landing of a powered lift STOL aircraft
[NASA-TM-X-62144] N77-33151
APPROXIMATION
Analysis of wire antennas in the presence of a conducting half space. Part 3: The buried antenna
[UCRL-52228] N77-33400
ARC LAMPS
Manufacturing methods and technology [MMTE] measure for fabrication of low voltage start sealed beam arc lamps
[AD-A041517] N77-33414
ARCHITECTURE
State environmental issues series. Energy conservation. Policy considerations for the states
[PB-267857/1] N77-33663
Window design strategies to conserve energy
[PB-269297/8] N77-33669
Building energy conservation programs: A preliminary examination of regulatory activities at the state level
[PB-268873/7] N77-33673
Human behavior in institutional fires and its design implications
[NBS-GCR-77-93] N77-33854
ARGON
Analysis of gases in metals: The dc arc gas chromatographic technique. Part 4: Simultaneous determination of H2, O2, and N2 in metals using argon as inert gas medium
[BARC-800-PT-4] N77-33307
ARID LANDS
Applied Remote Sensing Program [ARSP] — Apache, Yavapai, Graham, and Yuma countries, Arizona
[E77-10240] N77-33571
ARITHMETIC
Arithmetical semigroup rings
N77-33948
ARIZONA
Spectral measurement of watershed coefficients in the southern Great Plains — Texas, Arizona, and New Mexico
[E77-10225] N77-33556
Applied Remote Sensing Program [ARSP] — Apache, Yavapai, Graham, and Yuma countries, Arizona
[E77-10240] N77-33571
Moisture distribution modification by upward vertical motion
[PB-268740/8] N77-33763
ARTIFICIAL INTELLIGENCE
An overview of OWL, a language for knowledge representation
[AD-A041372] N77-33892
ASCENT TRAJECTORIES
Mathematical model for ascent trajectory optimization of a 4-stage launch vehicle for geosynchronous missions
[ESA-TT-409] N77-33246
ASIA
A numerical experiment of the development of the zonally symmetric northern summer monsoon
[AD-A042103] N77-33749
ASSEMBLY LANGUAGE
Conversion of computer software for the gimballed electrostatic gyro navigation system, volume I
[AD-A041711] N77-33138
ASSESSMENTS
Problems affecting usefulness of the national water assessment: Water resources council
[PB-269257/2] N77-33594
ASTEROIDS
Report of the Terrestrial Bodies Science Working Group. Volume 1: Executive summary — Terrestrial planets, Galilean satellites, Comets, Asteroids, and the Moon
[NASA-CR-155189] N77-34074
Report of the Terrestrial Bodies Science Working Group. Volume 6: The asteroids
[NASA-CR-155184] N77-34079
ASTRONAUTS
Investigate methods for measuring muscle and bone mass changes in astronauts and animals which occur during space flight
[NASA-CR-151518] N77-33837
Psychometric characteristics of astronauts
[AD-A039228] N77-33855
ASTRONOMICAL SPECTROSCOPY
The 2-8 GHz solar dynamic spectra and polarization measurement feasibility study
[NASA-CR-152604] N77-34085
ASTROPHYSICS
Recognition of compact astrophysical objects
[NASA-SP-421] N77-34063
ASYMPTOTIC SERIES
Asymptotic properties of the discrete minimum variance output feedback control
[AD-A042782] N77-33903
ATLANTIC OCEAN
GATE convection subprogram data center: Comparison of ship-surface, rawinsonde, and tethered sonde wind measurements
[PB-268848/9] N77-33767
Atlantic tropical and subtropical cyclone classification for 1976
[PB-269674/8] N77-33768
Meteorological forcing fields of the New York bight
[PB-269442/0] N77-33774
A study of the intermediate and long wavelength gravity field of the worlds oceans
N77-33777
ATLIT PROJECT
Flight evaluation of an advanced technology light twin-engine airplane [ATLIT]
[NASA-CR-2832] N77-33104
ATMOSPHERES
Radiative transfer in spherical shell atmospheres. 2: Asymmetric phase functions
[NASA-CR-155162] N77-33443
GATE convection subprogram data center: Comparison of ship-surface, rawinsonde, and tethered sonde wind measurements
[PB-268848/9] N77-33767
ATMOSPHERIC ATTENUATION
Earth-space attenuation prediction procedures at 4 to 16 GHz
[PB-269228/3] N77-33402
The use of lidar for stratospheric measurements
[NASA-TM-74085] N77-33498
A polynomial representation of 6-3 micrometers water vapor and 4.3 micrometers CO2 atmospheric transmissivities
[PB-267593/2] N77-33973
ATMOSPHERIC CHEMISTRY
Calculation of selected atmospheric composition parameters for the mid-latitude, September stratosphere
[AD-A041081] N77-33725
Collisional dissociation and structural properties of atmospheric negative ions
[AD-A042111] N77-33730
ATMOSPHERIC CIRCULATION
Boundary layer dust occurrence. 4: Atmospheric dust over selected geographical areas
[AD-A041077] N77-33726
Comments on certain boundary layer parameterization schemes used in atmospheric circulation models
[AD-A042057] N77-33731
Relationship between lake-induced disturbances and synoptic circulation
[PB-269406/5] N77-33741
Formulation of approximate equations for modeling moist deep convection on the mesoscale
[PB-267592/4] N77-33756
Moisture distribution modification by upward vertical motion
[PB-268740/8] N77-33763
A numerical study of the diurnal variation of the low-level jet
[PB-269484/2] N77-33772
ATMOSPHERIC COMPOSITION
Lidar detection of subvisible reentry vehicle erosive atmospheric material
[AD-A041085] N77-33724
Changes in the composition of the atmosphere and their impact upon climatic variability: An overview
[BMA-24] N77-33761
Atmospheric analyzer, carbon monoxide monitor and toluene diisocyanate monitor
N77-33834
ATMOSPHERIC DIFFUSION
Discrete event approach to pollutant transport and vegetation effects
[ORNL-CSD-TM-11] N77-33694
Description and review of global measurements of atmospheric species from GASP
[NASA-TM-73781] N77-33...
ATMOSPHERIC MODELS
A qualitative assessment of a random process proposed as an atmospheric turbulence model
[NASA-CR-145247] N77-33145
Calculation of selected atmospheric composition parameters for the mid-latitude, September stratosphere
[AD-A041081] N77-33725
Comments on certain boundary layer parameterization schemes used in atmospheric circulation models
[AD-A042057] N77-33731
Statistical diagnostic modeling of marine fog using model output parameters
[AD-A042059] N77-33748
Weather forecasting and weather forecasts: Models, systems and users. Volume 2: Notes from a colloquium
[PB-268914/9] N77-33775
Weather forecasting and weather forecasts: Models, systems, and users. Volume 1: Notes from a colloquium
[PB-268913/1] N77-33776
ATMOSPHERIC PHYSICS
Atmospheric dispersion characteristics in the Louisiana coastal zone
[AD-A041099] N77-33747
ATMOSPHERIC RADIATION
Environmental change pattern in central Japan as revealed by LANDSAT data
[E77-10231] N77-33562
ATMOSPHERIC SCATTERING
The use of lidar for stratospheric measurements
[NASA-TM-74085] N77-33498
ATMOSPHERIC TEMPERATURE
Environmental change pattern in central Japan as revealed by LANDSAT data
[E77-10231] N77-33562
ATMOSPHERIC TURBULENCE
A qualitative assessment of a random process proposed as an atmospheric turbulence model
[NASA-CR-145247] N77-33145
Meteorological forcing fields of the New York bight
[PB-269442/0] N77-33774
ATOMIC ENERGY LEVELS
Studies of crystal field, temperature, and concentration effects on the lowest triplet states of aromatic molecules in mixed single crystals
N77-33292
Investigations on approximate quantum mechanical wave functions for first period atoms and molecules
N77-33964
Charge states of low energy ions from the sun
[NASA-CR-152586] N77-34084
ATOMIC RECOMBINATION
Thin film atomic hydrogen detectors
[NASA-CR-152605] N77-33482
ATOMIC SPECTRA
Displacement cross sections and PKA spectra: Tables and applications
[HEDL-TME-76-70] N77-33332
ATOMIC STRUCTURE
Electronic structure of biopolymers
N77-33336
ATS 5
Active experiments in modifying spacecraft potential: Results from ATS-5 and ATS-6
[NASA-CR-152607] N77-33262
ATS 6
Active experiments in modifying spacecraft potential: Results from ATS-5 and ATS-6
[NASA-CR-152607] N77-33262
ATS-6 solar cell experiment/improvement
[NASA-CR-152609] N77-33607
AUDITORY DEFECTS
Noise induced hearing loss. Noise evaluation. The use of hearing protectors
[NTNF-4] N77-33852

AUDITORY PERCEPTION
Recovery of middle components of human auditory averaged electroencephalic response
N77-33953

AUDITORY SENSATION AREAS
Recovery of middle components of human auditory averaged electroencephalic response
N77-33953

AURORAL ARCS
Spiral-like auroral forms: Observations and a proposed theory
N77-33713

AURORAL IONIZATION
Electromagnetic plasma wave emissions from the auroral field lines
[NASA-CR-155172] N77-33387

AURORAS
On the role of magnetic mirroring in the auroral phenomena
[NASA-CR-155144] N77-33717
Calculations of soft auroral bremsstrahlung and K alpha line emission at satellite altitude
[AD-A041599] N77-33727

AUSTENITE
Effect of double vacuum melting and retained austenite on rolling-element fatigue life of AMS 5749 bearing steel
[NASA-TP-1060] N77-33520

AUTOMATIC CONTROL
Requirements for flight testing automated terminal service
[AD-A041975] N77-33137

AUTOMATIC FLIGHT CONTROL
Structural Aspects of Active Controls
[AGARD-CP-228] N77-33208
YC-14 control system redundancy
N77-33214

AUTOMATIC TEST EQUIPMENT
Underground coal mine instrumentation and test
[NASA-CR-150045] N77-33479

AUTOMATIC TYPEWRITERS
Survey of computer-assisted writing and editing systems
[AGARD-AG-229] N77-34041

AUTOMOBILE ACCIDENTS
Tolerance and response of the knee-femur-pelvis complex to axial impact
[PB-269059/2] N77-33864
PROMETHEUS 2: A user oriented program for human crash dynamics
[PB-269305/9] N77-33866

AUTOMOBILE ENGINES
Compendium of critiques of JPL report SP-43-17: Automotive technology status and projections project
[NASA-CR-155180] N77-33519

AUXILIARY POWER SOURCES
Subsystem design analysis light weight alternator [model test program]. Addendum 2
[AD-A041257] N77-33171

AVIONICS
The software design and verification system [SDVS]
[AD-A042126] N77-33884

AXIAL FLOW
Experimental and theoretical investigation of three-dimensional turbulent boundary layers and turbulence characteristics inside an axial flow inducer passage
[NASA-CR-2888] N77-33106

AXIAL STRESS
Biaxial testing of graphite/epoxy composites containing stress concentrations, part 1
[AD-A041490] N77-33268

AXISYMMETRIC FLOW
Propulsion nozzle studies. Volume 2: Design of maximum thrust nozzle-base-boattail contours
[AD-A041530] N77-33174
Theory of two-fluid equilibrium of an axially symmetric plasma
[IPPJ-282] N77-33997

AZIDES [INORGANIC]
Mass spectrometric measurement of velocity distributions of nitrogen molecules in the expansion gas of lead azide after ultrahigh vacuum detonation
[ISL-R-108/76] N77-33308

B

B-1 AIRCRAFT
Design and development of a structural mode control system
[NASA-CR-143846] N77-33201

BACKSCATTERING
Surface detail and backscatter from coherently illuminated targets rotating about the axis of symmetry
[AD-A042349] N77-33506

BALL BEARINGS
Steady-state unbalance response of a three-disk flexible rotor on flexible, damped supports
[NASA-TM-X-73666] N77-33160
Analysis of film thickness effect in slow-speed lightly-loaded elastrohydrodynamic contacts. Part 3: Experimental measurement of lubricant film thickness
[AD-A041205] N77-33522
Measurement of solid friction parameters of ball bearings
[AD-A042599] N77-33528

BALLISTICS
The 12817A Lance missile number 4106, round number 295 RCL
[AD-A041448] N77-33744
The 12815C Lance missile number 4043, round number 294 RSL
[AD-A041453] N77-33745
The 17901AT Honest John missile numbers 1483/1494 round numbers 656 ASL/658 ASL
[AD-A041449] N77-33746

BANDWIDTH
Extended bandwidth VTS-5753B1 coupled cavity traveling wave tube
[AD-A041564] N77-33417
Upgrading and testing program for narrow band high resolution planetary IR imaging spectrometer
[NASA-CR-155149] N77-33969

BARRIERS
Some test results on the visibility of obstacle and hazard beacons
[DLR-IB-553-76/5] N77-33862

BATCH PROCESSING
A tool-bearing host in the National Software Works
[AD-A041652] N77-33881

BAYES THEOREM
A Bayesian model for determining the optimal test stress for a single test unit
[AD-A041232] N77-33530
Bayesian decision theory in variables sampling for quality control
[AD-A042117] N77-33930
On slippage tests and multiple decision [selection and ranking] procedures
[AD-A041746] N77-33933

BAYS [TOPOGRAPHIC FEATURES]
Investigation of environmental change pattern in Japan. Utilization of LANDSAT-2 data for fisheries
[E77-10227] N77-33558
Application of LANDSAT MSS data to the study of oceanographical environment — Seto Inland Sea
[E77-10228] N77-33559
Significant applications of LANDSAT-2 MSS data to marine environment — Japanese coastal areas
[E77-10229] N77-33560
General pattern of the turbid water in the Seto-inland sea extracted from multispectral imageries by the LANDSAT-1 and 2
[E77-10230] N77-33561

BEACONS
Some test results on the visibility of obstacle and hazard beacons
[DLR-IB-553-76/5] N77-33862

BEAM WAVEGUIDES
A study of beam couplers for integrated optics
[AD-A042070] N77-33970

BEAMS [RADIATION]
Ionosphere/microwave beam interaction study — satellite solar energy conversion
[NASA-CR-151517] N77-33389

BEAMS [SUPPORTS]
Plane grillage suite of programs
[NCRE/R637] N77-33533

BEARING ALLOYS
Effect of double vacuum melting and retained austenite on rolling-element fatigue life of AMS 5749 bearing steel
[NASA-TP-1060] N77-33520

BEARINGS
Lubrication of high-speed, large bore tapered-roller bearings
[NASA-TM-X-73673] N77-33517

BERNOULLI THEOREM
Detecting the shift in the probability of success in a series of Bernoulli trails
[AD-A042739] N77-33940

BERYLLIUM ALLOYS
Lockalloy Be-38Al material characterization, 1976 year-end report
[AD-A041284] N77-33271

BIBLIOGRAPHIES
Bird strike hazards: A bibliography, 1971 - 1976
[NAL-BIBL-SER-77] N77-33131
Literature review of the remote sensing of natural resources — bibliography
[NASA-CR-155190] N77-33551
Reclamation of energy from solid waste: Theory and practice. A selected, annotated bibliography for Pennsylvania local government officials
[PB-267800/1] N77-33621
Upper atmosphere research bibliography of contaminant release experiments, part 3
[AD-A042565] N77-33733
Vestibular-visual interactions in flight simulators
[NASA-CR-155200] N77-33847
Bibliography of research reports and publications: Impact, vibration, windblast and escape, 1942 - 1976
[AD-A042201] N77-33850
An annotated bibliography of selected references on maximal inequalities and their applications
[AD-A042681] N77-33937

BINARY CODES
Compilation of documented computer codes applicable to environmental assessment of radioactivity releases
[ORNL-TM-5830] N77-33691

BINARY DIGITS
High bit rate digital recorder
[AD-A041320] N77-33485

BINARY MIXTURES
Physical properties of gasoline/methanol mixtures
[BERC/RI-76/12] N77-33375

BIOCHEMISTRY
Biochemical responses of the Skylab crewmen: An overview
N77-33803

BIODEGRADATION
Biodegradable polymer: Synthesis and characterization of Alpha-benzylated nylons and related polymers
N77-33343
The biodegradation of oil in sea water for naval pollution control
[AD-A042375] N77-33688

BIODYNAMICS
Electronic structure of biopolymers
N77-33336

BIOINSTRUMENTATION
Lower body negative pressure device
N77-33821
Automatic blood pressure measuring system [M091]
N77-33822
Automatic blood pressure measuring system [M092]
N77-33823
Vectorcardiograph
N77-33824
Metabolic analyzer
N77-33827
Hardware report for experiment M133, sleep monitoring on Skylab
N77-33829
Experiment support system
N77-33831
In-flight medical support system
N77-33832
Skylab hardware report operational bioinstrumentation system
N77-33835

BIOLOGICAL EFFECTS
Effect of prolonged space flight on cardiac function and dimensions
N77-33815
Pulmonary function evaluation during and following Skylab space flights
N77-33817
Determination of cardiac size from chest roentgenograms following Skylab missions
N77-33819
Skylab: A beginning
N77-33820
Automatic blood pressure measuring system [M092]
N77-33823
Biological effects of electromagnetic waves. Selected papers of the USNC/URSI Annual Meeting, volume 2
[PB-268095/7] N77-33853

BIOLOGY
Translation on USSR science and technology biomedical sciences, no. 9
[JPRS-69899] N77-33841
Translations on USSR science and technology biomedical sciences, no. 10
[JPRS-69924] N77-33842

BIOMASS ENERGY PRODUCTION
Marine pastures: A by-product of large [100 megawatt or larger] floating ocean-thermal power plants
[COO-2581-3] N77-33625
Biological conversion of biomass to methane
[COO-2917-76-2] N77-33627

BIOMEDICAL DATA
Biomedical results from Skylab
[NASA-SP-377] N77-33780
Skylab medical program overview
N77-33781
Flight control experiences
N77-33782
Skylab 4 crew observations
N77-33783
Skylab 2 crew observations and summary
N77-33784
Skylab oral health studies
N77-33786
Skylab environmental and crew microbiology studies
N77-33788
Radiological protection and medical dosimetry for the Skylab crewmen
N77-33789

BIOMETRICS
Translations on USSR science and technology biomedical sciences, no. 12
[JPRS-70017] N77-33844

BIOTELEMETRY
Retention of selected physiological indicators in pilots in the course of agricultural flights
[NASA-TT-F-17441] N77-33845

BIRD-AIRCRAFT COLLISIONS
Bird strike hazards: A bibliography, 1971 - 1976
[NAL-BIBL-SER-77] N77-33131
BLACK HILLS [SD-WY]
Application of remote sensing in South Dakota to provide accurate inventories of agricultural crops, enhance contrast in photographic products, monitor rangeland habitat loss, map Aspen, and prepare hydrogeologic surveys
[E77-10237] N77-33568
BLOOD
A.I.e. in-flight blood collection system
N77-33825
BLOOD PRESSURE
Automatic blood pressure measuring system [M092]
N77-33823
BLOOD VOLUME
Blood volume changes
N77-33806
Automatic blood pressure measuring system [M091]
N77-33822
BOATTAILS
Propulsion nozzle studies. Volume 2: Design of maximum thrust nozzle-base-boattail contours
[AD-A041530] N77-33174
BODY FLUIDS
Biostereometric analysis of body form
N77-33802
BODY TEMPERATURE
Body temperature measuring system [M171]
N77-33828
BODY VOLUME [BIOLOGY]
Biostereometric analysis of body form
N77-33802
BODY WEIGHT
Physiological mass measurements in Skylab
N77-33799
BOILERS
Technical and economic feasibility of solar augmentation for boiler feedwater heating in steam-electric power plants
[COO-2864-1] N77-33626
K-area boiler-turbine alternator. Validation tests and validation project
[BNWL-2168] N77-33653
Evaluation of stationary source particulate measurement methods. Volume 2: Oil-fired steam generators
[PB-269081/6] N77-33705
BONE DEMINERALIZATION
Bone mineral measurement: Experiment M078
N77-33800
BONE MINERAL CONTENT
Investigate methods for measuring muscle and bone mass changes in astronauts and animals which occur during space flight
[NASA-CR-151518] N77-33837
BOUNDARY LAYER SEPARATION
Investigation of supersonic turbulent boundary-layer separation on a compression ramp by an integral method
[NASA-TM-74065] N77-33439
Subsonic diffuser with injection flow
[RM-644] N77-33441
BOUNDARY LAYER STABILITY
A numerical study of nonlinear effects on boundary-layer stability
[AD-A041088] N77-33446
BOUNDARY LAYER TRANSITION
A survey of transition research at AEDC
[AD-A041740] N77-33219
Prediction techniques for the characteristics of fin generated three dimensional shock wave turbulent boundary layer interactions
[AD-A042024] N77-33447
Prediction of onset and development of boundary layer transition
[AAAF-NT-77-03] N77-33470
BOUNDARY LAYERS
Comments on certain boundary layer parameterization schemes used in atmospheric circulation models
[AD-A042057] N77-33731
BOUNDARY VALUE PROBLEMS
Calculation of reference orbits by solving selfadjoint boundary value problem
[SER-C/DISS-228] N77-33228
A boundary value control problem for hyperbolic systems
N77-33908
Numerical solution of a class of random boundary value problems
N77-33909
An algorithm for minimizing a differentiable function subject to box constraints and errors
[AD-A042916] N77-33924
EPISODE: An effective package for the integration of systems of ordinary differential equations --- including boundary value problems
[UCID-30112-REV-1] N77-33925
BRAKES [FOR ARRESTING MOTION]
Behavior of aircraft antiskid breaking systems on dry and wet runway surfaces: A slip-ratio-controlled system with ground speed reference from unbraked nose wheel
[NASA-TN-D-8455] N77-33150
BREMSSTRAHLUNG
Calculations of soft auroral bremsstrahlung and K alpha line emission at satellite altitude
[AD-A041599] N77-33727
BRITTLENESS
A Weibull characterization for tensile fracture of multicomponent brittle fibers
[NASA-TM-73790] N77-33929
BROADBAND
The present technology of impulse radars
[AD-A042094] N77-33394
BUCKLING
Elastic plate buckling using finite elements
[NCRE/R627] N77-33532
Evaluation of design safety factors for time-dependent buckling
[SAND-76-0721] N77-33547
BUDGETING
Ocean Thermal Energy Conversion [OTEC] program summary
[ERDA-76-142] N77-33642
BUILDINGS
Wind load requirements for buildings
[PB-268547/7] N77-33385
UNDSAFE-I: A computer code for buoyant flow in an enclosure
[PB-267278/0] N77-33476
BURSTS
Digital filtering using burst processing techniques
[AD-A042657] N77-33424

C

C BAND
Feasibility study of microprocessor systems suitable for use in developing a real-time for the 4.75 GHz scatterometer
[NASA-CR-151522] N77-33585
C-135 AIRCRAFT
Air traffic control experimentation and evaluation test
[AD-A041971] N77-33136
CABIN ATMOSPHERES
Notes on the pollution of airplanes and helicopters by chemicals during agricultural jobs
[NASA-TT-F-17444] N77-33129
Atmospheric analyzer, carbon monoxide monitor and toluene diisocyanate monitor
N77-33834
CABLES [ROPES]
Investigation and status report on concentric neutral corrosion of URD extruded cable
[EPRI-EL-362] N77-33327
Design and fabrication of termination boots for mechanical/electromechanical cable terminations
[AD-A041857] N77-33526
CADMIUM
Behavior of mercury, chromium, and cadmium in aquatic systems
[PB-267559/3] N77-33687
CALCIUM OXIDES
Mullite phase equilibria in the system: CaO-Al2O3-SiO2
[LBL-5706] N77-33329
CALCULATORS
Investigation of card programmable and chip programmable packet calculators and calculator systems for use at Naval Post-graduate School and in the naval establishment
[AD-A041067] N77-33870
CALIBRATING
Calibration results for the GEOS-3 altimeter
[NASA-CR-141430] N77-33261
Superconducting magnetic calibration source for magnetic anomaly detection MAD operations
[AD-A041738] N77-33421
Calibration technology for meteorological satellites
[AD-A041662] N77-33750
CALIFORNIA
Analysis of the California energy industry
[LBL-5928] N77-33640
CANOPIES
Investigation of inside light reflection problem on the Flat Plate Canopy [FPC] for model 209 AH-IS helicopter
[AD-A041332] N77-33858
CAPACITORS
Design definition of a mechanical capacitor
[NASA-CR-152613] N77-33603
CARBON DIOXIDE
Carbon dioxide/dewpoint monitor
N77-33833
A polynomial representation of 6-3 micrometers water vapor and 4.3 micrometers CO2 atmospheric transmissivities
[PB-267593/2] N77-33973
CARBON DIOXIDE LASERS
Interaction of pulsed CO2 and pulsed HF/DF laser radiation with gaseous and solid targets
[AD-A041486] N77-33500
CARBON MONOXIDE
Evaluation of continuous monitors for carbon monoxide in stationary sources
[PB-268861/2] N77-33708
Toxicological aspects of the Skylab program
N77-33790
Atmospheric analyzer, carbon monoxide monitor and toluene diisocyanate monitor
N77-33834
CARBON MONOXIDE LASERS
Laser dynamics and rotational relaxation in chemically formed carbon monoxide. Part 2: Further development and optimization of the chemical CO-laser
[ISL-R-137/76] N77-33514
CARBOXYLIC ACIDS
The corrosion kinetics of copper in aqueous amino acid and carboxylic acid solutions
N77-33312
CARDIOVASCULAR SYSTEM
Evaluation of the electromechanical properties of the cardiovascular system after prolonged weightlessness
N77-33814
Response of the cardiovascular system to vibration and combined stresses
[AD-A039000] N77-33848
CATALYSTS
Temperature programmed exchange studies of supported metal catalysts
N77-33281
CATALYTIC ACTIVITY
Heterogeneous acid catalysis by polymer colloids
N77-33339
CATHODE RAY TUBES
Conference on Luminescence Processes in Cathode-ray Tubes and lamps
[AD-A041443] N77-33412
CAVITIES
Coupling through rotationally symmetric apertures in cavities of revolution
[AD-A042093] N77-33390
Extended bandwidth VTS-5753B1 coupled cavity traveling wave tube
[AD-A041564] N77-33417
CELESTIAL BODIES
Recognition of compact astrophysical objects
[NASA-SP-421] N77-34063
CEMENTS
Cement content of fresh concrete
[PB-266931/5] N77-33549
CENTAUR PROJECT
Vapor ingestion in Centaur liquid-hydrogen tank
[NASA-TP-1061] N77-33444
CENTRIFUGAL COMPRESSORS
The current state of research and design in high pressure ratio centrifugal compressors --- for gas turbine engines
[AD-A041011] N77-33172
CERAMICS
Lead zirconate titanate [lzt] ceramics
[AD-A041507] N77-33360
CESIUM FLUORIDES
Scattering of rotational state selected C sF molecules by low energy electrons, 1. Determination of the surface disulfide bridge in proteins by pulse radiolysis, 2
N77-33290
CHARGE DISTRIBUTION
Surface charge kinetics near metal-dielectric interfaces exposed to kilovolt electron flux
[NASA-CR-155195] N77-33411
Charge states of low energy ions from the sun
[NASA-CR-152586] N77-34084
CHARGED PARTICLES
Medium energy charged particle spectrometer. Experiment E8 Helios
[ESA-TT-390] N77-34089
CHELATES
An electron paramagnetic resonance study of some tetradentate Schiff base complexes of copper [II]
N77-33279
CHEMICAL ANALYSIS
Evaluation of analytical methodology for hydrocarbons in high pressure air and nitrogen systems --- evaluation of methodology
[NASA-CR-150409] N77-33379
Evaluation of analytical methodology for hydrocarbons in high pressure air and nitrogen systems --- data aquisition
[NASA-CR-150410] N77-33380
Chemical-analytical techniques for aerosols
[BNL-22440] N77-33690
Particle size distribution of nitrate aerosols in the Los Angeles air basin
[PB-269349/7] N77-33703
CHEMICAL BONDS
The understanding of molecular properties by both experimental and theoretical methods: The localized molecular orbitals of transition metal complexes, and the ionization potentials of n-alkenes
N77-33284
CHEMICAL EQUILIBRIUM
On the units of the equilibrium constant
[AD-A041953] N77-34028

CHEMICAL LASERS
Medium homogeneity in a chemical laser cavity using a lateral shearing interferometer
[AD-A042504] N77-33508
Laser dynamics and rotational relaxation in chemically formed carbon monoxide. Part 2: Further development and optimization of the chemical CO-laser
[ISL-R-137/76] N77-33514
CL XI nozzle F2 absorption experiment
[AD-A041566] N77-33515

CHEMICAL REACTIONS
Studies of the mechanism of AgCl/Ag electrode reaction
N77-33274
Mass filtering and velocity analysis of products of single collision reactions of barium with alkali halides
N77-33282
Low temperature fluorine chemistry of electronegative elements
[AD-A041439] N77-33298
Polymerization of methyl methacrylate initiated by t-butyl hydroperoxide in the presence of metal acetylacetonates
N77-33338
Crystallization-induced reaction of aromatic copolyesters
N77-33340
The synthesis and characterization of the poly[metal phosphinates]
[AD-A041511] N77-33357

CHEMILUMINESCENCE
Study of selected diatomic metal oxides and halides using chemiluminescence and laser-induced flourescence
N77-33291

CHEMISORPTION
Island dissolution phase transition in a chemisorbed layer
[AD-A042444] N77-33303

CHEST
Automated chest X-ray analysis
[LA-UR-77-532] N77-33851

CHIPS [MEMORY DEVICES]
Investigation of card programmable and chip programmable packet calculators and calculator systems for use at Naval Post-graduate School and in the naval establishment
[AD-A041067] N77-33870

CHLOROPLASTS
Biological solar energy conversion: Approaches to overcome yield, stability and product limitations
[PB-267937/1] N77-33619

CHROMIUM
Behavior of mercury, chromium, and cadmium in aquatic systems
[PB-267559/3] N77-33687

CHROMIUM COMPOUNDS
Reversible intermolecular energy transfer between chromium [3] complexes in fluid solution
[AD-A040661] N77-33966

CHROMOSOMES
Cytogenetic studies of blood, experiment M111
N77-33804

CHRONOPHOTOGRAPHY
Transient turbulent flow visualization by ultrafast chronophotography
[AAAF-NT-77-22] N77-33125
Processing of photographical data for analysis of target deformation in terminal ballistics experiments
[ISL-CO-201/76] N77-33494

CIRCUIT BOARDS
Use of a microprocessor-based interactive system to increase production of printed wiring board artwork
[SAND-77-8503] N77-33431

CIRCUIT BREAKERS
High speed foil breakers
[UCRL-TRANS-11226] N77-33428

CIRCUIT RELIABILITY
The effects of substrate composition on thick film circuit reliability
[AD-A041572] N77-33416

CIRCUITS
Ultraprecise parabolic interpolator for numerically controlled machine tools
[REPT-40004] N77-33529

CIRCULAR CYLINDERS
Threedimensional flow around a fixed transverse cylinder
[AAAF-NT-77-19] N77-33126

CIRRUS CLOUDS
Environmental change pattern in central Japan as revealed by LANDSAT data
[E77-10231] N77-33562

CITIES
Environmental change pattern in central Japan as revealed by LANDSAT data
[E77-10231] N77-33562
An analysis on vegetation cover by using LANDSAT MSS data
[E77-10245] N77-33576
Improved engineering-economic model of residential energy use
[ORNL-CON-8] N77-33644
Analytical approach to the determination of urban population density gradients and its application to energy planning problems
[BNL-20916] N77-34054
Regional data center
[PB-268883/6] N77-34056

CLIMATE
TEHM: A Terrestrial Ecosystem Hydrology Model
[EDFB-IBP-76-8] N77-33592

CLIMATOLOGY
Environmental change pattern in central Japan as revealed by LANDSAT data
[E77-10231] N77-33562
The application of ERTS imagery to the FAO/Unesco soil map of the world
[E77-10236] N77-33567
Reforger 77 support. Part B: Test of a suggested approach to spreading climatology to grid points
[AD-A041879] N77-33752
Changes in the composition of the atmosphere and their impact upon climatic variability: An overview
[BMA-24] N77-33761

CLOCKS
Special relativity and the conventionality of simultaneity
N77-34027

CLOTHING
The measurement of fabric flammability parameters in movement simulation experiments
[PB-268902/4] N77-33309

CLOUD COVER
Environmental change pattern in central Japan as revealed by LANDSAT data
[E77-10231] N77-33562

CLOUD PHYSICS
Formulation of approximate equations for modeling moist deep convection on the mesoscale
[PB-267592/4] N77-33756
On the use of finite Taylor's series approximations to certain exponential and power functions employed in cloud models
[PB-267834/0] N77-33762

CLOUDS [METEOROLOGY]
On the use of finite Taylor's series approximations to certain exponential and power functions employed in cloud models
[PB-267834/0] N77-33762

COAL
Systems studies of energy conservation: Methane produced from coalbeds, volume 1
[MERC/CR-77/4-VOL-1] N77-33660
Systems studies of energy conservation: Methane produced from coalbeds, volume 2
[MERC/CR-77/4-VOL-2] N77-33661

COAL GASIFICATION
Coal gasification study
[AD-A041860] N77-33615
Experimental program for the development of peat gasification
[FE-2469-3] N77-33650

COAL LIQUEFACTION
Hydrogen production from coal liquefaction residues
[EPRI-AF-233] N77-33374

COASTAL WATER
Application of LANDSAT MSS data to the study of oceanographical environment — Seto Inland Sea
[E77-10228] N77-33559
Significant applications of LANDSAT-2 MSS data to marine environment — Japanese coastal areas
[E77-10229] N77-33560
Investigation of environmental change pattern in Japan. Investigation of variations in the prominent oceanic current, Kuroshio
[E77-10232] N77-33563

COASTS
Application of remote sensing technology to the solution of problems in the management of resources in Indiana
[E77-10223] N77-33554
Investigation of environmental change pattern in Japan. Utilization of LANDSAT-2 data for fisheries
[E77-10227] N77-33558
Seismotectonic, structural, volcanologic, and geomorphic study of New Zealand; indigenous forest assessment in New Zealand; mapping, land use, and environmental studies in New Zealand, volume 1
[E77-10233] N77-33564
Atmospheric dispersion characteristics in the Louisiana coastal zone
[AD-A041099] N77-33747

COATINGS
Optical coatings 2-6 microns — thin film deposition
[AD-A041130] N77-33971

COAXIAL PLASMA ACCELERATORS
Dynamics of a coaxial plasma gun
[TRITA-EPP-77-02] N77-34014

COCKPIT SIMULATORS
Methods for the electronic simulation of flight sounds
[NASA-TT-F-17432] N77-33956

COCKPITS
Investigation of inside light reflection problem on the Flat Plate Canopy [FPC] for model 209 AH-IS helicopter
[AD-A041332] N77-33858

COHERENCE COEFFICIENT
Identification and measurement of combustion noise from a turbofan engine using correlation and coherence techniques
[NASA-TM-73747] N77-33162
Measurement of far field combustion noise from a turbofan engine using coherence functions
[NASA-TM-73748] N77-33163

COHERENT RADIATION
Surface detail and backscatter from coherently illuminated targets rotating about the axis of symmetry
[AD-A042349] N77-33506

COLD FRONTS
Analysis of cool season lake-related mesoscale phenomena using numerical variational analysis
[PB-269619/3] N77-33771

COLLECTION
A.I.e. in-flight blood collection system
N77-33825

COLLIMATION
Magneto-optic development for laser beam steering
[AD-A042985] N77-33509

COLLISION PARAMETERS
Mass filtering and velocity analysis of products of single collision reactions of barium with alkali halides
N77-33282

COLLISIONAL PLASMAS
Nonlinear heat and particle transport due to collisional drift waves
[IPPJ-281] N77-33996

COLLOIDS
Heterogeneous acid catalysis by polymer colloids
N77-33339
The surface chemistry of acrylic polymer colloids
N77-33345

COLOR
Optical analysis of a multicolor model of the 360 degree nonprogrammed visual display
[AD-A042092] N77-33499

COMBUSTION
A shock tube study of the H2/02/CO/AR and H2/N2O/CO/Ar systems
[AD-A041340] N77-33299

COMBUSTION CHAMBERS
Identification and measurement of combustion noise from a turbofan engine using correlation and coherence techniques
[NASA-TM-73747] N77-33162
Development of a three-dimensional combustor flow analysis. Volume 3: User's manual for the MINT computer code
[AD-A041351] N77-33173
Development of a three-dimensional combustor flow analysis. Volume 2: Theoretical studies
[AD-A042122] N77-33302

COMBUSTION EFFICIENCY
Pollution reduction technology program for small jet aircraft engines, phase 1
[NASA-CR-135214] N77-33168

COMBUSTION STABILITY
Measurement of far field combustion noise from a turbofan engine using coherence functions
[NASA-TM-73748] N77-33163

COMETS
Report of the Terrestrial Bodies Science Working Group. Volume 1: Executive summary — Terrestrial planets, Galilean satellites, Comets, Asteroids, and the Moon
[NASA-CR-155189] N77-34074
Report of the Terrestrial Bodies Science Working Group. Volume 8: The comets
[NASA-CR-155181] N77-34081

COMMAND AND CONTROL
Computer-based supervisory system for managing information flow in C3 systems: Pacing model
[AD-A040359] N77-33391

COMMUNICATION CABLES
Design and fabrication of termination boots for mechanical/electromechanical cable terminations
[AD-A041857] N77-33526

COMMUNICATION NETWORKS
Performance analysis of computer communication networks via random access channels
[AD-A041982] N77-33893

COMMUNICATIONS TECHNOLOGY SATELLITE
Early performance of the 12-GHz, 200-watt transmitter experiment package in the communications technology satellite
[NASA-TM-X-3555] N77-33258

COMMUNITIES
Further sensitivity studies of community-aircraft noise exposure [NOISEMAP] prediction procedures
[AD-A041781] N77-33686

COMPLEX SYSTEMS
Reversible intermolecular energy transfer between chromium [3] complexes in fluid solution
[AD-A040661] N77-33966

COMPONENT RELIABILITY
CFM56 turbofan maintainability and reliability-oriented development N77-33189
Sophistication and reliability — of modern materials for aircraft N77-33191

COMPOSITE MATERIALS
Response of graphite composites to laser radiation [AD-A041283] N77-33267
A general three-dimensional computational model for nonlinear composite structures and materials [AD-A041413] N77-33269
Lockalloy Be-38Al material characterization, 1976 year-end report [AD-A041284] N77-33271
Advanced composites: Electromagnetic properties, vulnerabilities, and protective measures [AD-A042043] N77-33272

COMPOSITE STRUCTURES
Evaluation of composite wing for XFV-12A airplane [AD-A041208] N77-33152

COMPRESSED AIR
Preliminary feasibility evaluation of compressed air storage power systems, volume 1 [CONS/NSF/42-1] N77-33636

COMPRESSIBLE FLOW
A critical compilation of compressible turbulent boundary layer data [AGARD-AG-223] N77-33220

COMPRESSING
Formation and adiabatic compression of reversed-field theta pinches in imploding liners [AD-A041737] N77-34007

COMPRESSORS
Analytical and experimental studies of acoustic performance of segmented liners in a compressor inlet [NASA-CR-2882] N77-33960

COMPUTATION
Computations in turbulent flows and off-design performance predictions for airframe-integrated scramjets [NASA-CR-155053] N77-33438
Compilation of documented computer codes applicable to environmental assessment of radioactivity releases [ORNL-TM-5830] N77-33691

COMPUTER DESIGN
Development and construction of the small data acquisition system MINIDIG — for use on motor gliders ASK 16 [DLR-IB-553-76/6] N77-33492

COMPUTER GRAPHICS
LANDSAT planning applications in east central Florida [E77-10238] N77-33569
UXDD80 graphic system [UCID-30146] N77-33873

COMPUTER NETWORKS
Fault tolerant computing: A preamble for assuring viability of large computer systems [NASA-TP-1067] N77-33868
Performance analysis of computer communication networks via random access channels [AD-A041982] N77-33893
Computer networks in the physical sciences [LBL-5594] N77-33894
Passage time distribution for a class of queueing networks: closed, open, or mixed, with different classes of customers with applications to computer system modeling [AD-A042723] N77-33945

COMPUTER PROGRAMMING
Two-dimensional numerical model of the nearfield flow for an ocean thermal power plant. Part 3: Manual for the computer code NRFL02 [DSE/1005-7] N77-33623
An application of CP/CMS to the time series analysis [AD-A041178] N77-33878
The software design and verification system [SDVS] [AD-A042126] N77-33884
Writing structured programs in dialog mode [PU1R4/74] N77-33887
Writing reliable programs [PU1R4/75] N77-33888

COMPUTER PROGRAMS
NSEG: A segmented mission analysis program for low and high speed aircraft. Volume 2: Program users manual [NASA-CR-2808] N77-33100
Conversion of computer software for the gimballed electrostatic gyro navigation system, volume 1 [AD-A041711] N77-33138
Improved computer programs for calculating potential flow in propulsion system inlets [NASA-TM-73728] N77-33164
Computer program for determining the thermodynamic properties of light hydrocarbons [UTEC-ME-76-211] N77-33376
Computations in turbulent flows and off-design performance predictions for airframe-integrated scramjets [NASA-CR-155053] N77-33438
Derivation of conservative finite difference expressions for the Navier-Stokes equations [K/CSD-5] N77-33455
PFLASH: A program to calculate Fourier cosine coefficients for pressure distributions [SAND-76-0280] N77-33456
Reservoir flow: Two-phase incompressible flow — using finite element method [STF71-A74038] N77-33461
UNDSAFE-I: A computer code for buoyant flow in an enclosure [PB-267278/0] N77-33476
Heat transfer analysis for unsteady high velocity pipe flow — gun barrels [AD-A041547] N77-33477
PLANS; a finite element program for nonlinear analysis of structures. Volume 2: User's manual [NASA-CR-145244] N77-33535
Coupling of X-ray deposition structural response [AD-A042667] N77-33544
Computer software for the assessment of growth histories of weather radar echoes [PB-268753/1] N77-33764
PROMETHEUS 2: A user oriented program for human crash dynamics [PB-269305/9] N77-33866
Standardization, certification, maintenance, and dissemination of large scale engineering software systems [NASA-CP-2015] N77-33876
Computer technology in materials analysis. Part 1: Metals and alloys [AD-A041031] N77-33877
An investigation of programming practices in selected Air Force projects [AD-A041678] N77-33885
OPTREG: An interactive computer program for optimization and regression [PB-269480/0] N77-33891
Maintenance for the NET-2 network analysis program [AD-A041074] N77-33896
CSKYTI: An out-of-core Cholesky algorithm equation solver [with respect to profile] for the Texas Instruments' Advanced Scientific computer [AD-A042807] N77-33923
EPISODE: An effective package for the integration of systems of ordinary differential equations — including boundary value problems [UCID-30112-REV-1] N77-33925
Computer simulations on the nonlinear frequency shift and nonlinear modulation of ion-acoustic waves [IPPJ-266] N77-33983

COMPUTER STORAGE DEVICES
Memory organizations and their effectiveness for multiprocessing computers [AD-A042646] N77-33872

COMPUTER SYSTEMS DESIGN
Automated chest X-ray analysis [LA-UR-77-532] N77-33851
Interactive system design considerations [PU1R2/76] N77-33863

COMPUTER SYSTEMS PROGRAMS
UXDD80 graphic system [UCID-30146] N77-33873
Informality in program specifications [AD-A041669] N77-33879
Computer networks in the physical sciences [LBL-5594] N77-33894

COMPUTER TECHNIQUES
Informality in program specifications [AD-A041669] N77-33879
An investigation of programming practices in selected Air Force projects [AD-A041678] N77-33885
Computer visual systems for exploratory research N77-33895
Areal mapping of arbitrary plane regions onto rectangular meshes [UCID-174[illegible]] N77-33926

COMPUTERIZED DESIGN
F-8C adaptive flight control extensions — for maximum likelihood estimation [NASA-CR-2881] N77-33203

COMPUTERIZED SIMULATION
F100 multivariable control synthesis program: Evaluation of a multivariable control using a real-time engine simulation [NASA-TP-1056] N77-33169
Aggregated shorads attrition weapon deck — subroutine libraries [computers] [AD-A040390] N77-33242
Computer-based supervisory system for managing information flow in C3 systems: Pacing model [AD-A040359] N77-33391
Numerical solutions of the Buckley-Leverett problem [STF71-A75024] N77-33463
A finite element model for the analysis of waterflood performance [STF71-A75036] N77-33464
WFLOOD: Users's description. A simulation model for oil reservoirs subjected to waterflooding — based on finite element method [STF71-A76005] N77-33465
GASSIM. User's description: A gas reservoir simulation model [STF71-A76020] N77-33467
Vector processing in simulation [AD-A041747] N77-33883
Propagation of nonlinear ion acoustic wave with generation of long-wavelength waves [IPPJ-297] N77-34005
Adiabatic oscillations of the one-dimensional SGEMP boundary layer [AD-A041960] N77-34008

COMPUTERS
Ultraprecise parabolic interpolator for numerically controlled machine tools [REPT-40004] N77-33529
Earth resources technology system standalone software package: Description and user's guide [NASA-CR-152598] N77-33591
An implementation of the MSG interprocess communication protocol [AD-A041630] N77-33871
A tool-bearing host in the National Software Works [AD-A041652] N77-33881

CONCENTRATION [COMPOSITION]
Chemical-analytical techniques for aerosols [BNL-22440] N77-33690

CONCORDE AIRCRAFT
Progress in determining service life by endurance tests — Concorde aircraft N77-33195

CONCRETES
Corrosion behavior of steel fibrous concrete [AD-A041339] N77-33538
Strength of steel fiber concrete in adverse environments [AD-A041380] N77-33539
Cement content of fresh concrete [PB-266931/5] N77-33549

CONDUCTIVE HEAT TRANSFER
Research initiation: Mixed and hybrid finite element analysis of problems in structural mechanics [PB-268300/1] N77-33550

CONFERENCES
Power plant reliability [AGARD-CP-215] N77-33181
Wind load requirements for buildings [PB-268547/7] N77-33385
From Soup to Nuts: The 7th International Congress on Rheology [AD-A041227] N77-33445
Energy technologies for the west: Possible effects of Energy Technology on Land, Water, and Air Resources [TID-27444] N77-33632
Public participation in energy related decision making, edited transcripts [PB-268781/2] N77-33674
Biological effects of electromagnetic waves. Selected papers of the USNC/URSI Annual Meeting, volume 2 [PB-268095/7] N77-33853
Microprocessor Seminar, phase 2 [NASA-CR-155164] N77-33867
Standardization, certification, maintenance, and dissemination of large scale engineering software systems [NASA-CP-2015] N77-33876
Second workshop on conceptual design studies of Experimental Power Reactor-1 [ERDA-77-36] N77-34009

CONFIGURATION MANAGEMENT
Impact of competitive procurement on configuration control [AD-A042876] N77-34034

CONGRESSIONAL REPORTS
The President's energy program [GPO-88-556] N77-33599

CONICAL BODIES
The conically symmetric Navier Stokes equations: Numerical solution for hypersonic cone flow at high angle of attack [AD-A042072] N77-33123

CONICAL FLOW
The nonlinear distortion of propagation cones of lower hybrid wave in an inhomogeneous plasma [IPPJ-268] N77-33985

CONSERVATION
Building energy handbook. Volume 2: Forms for energy survey and appraisal [ERDA-76-163/2-VOL-2] N77-33659

CONSOLES
Improved seat, console, and workplace design: Annotated bibliography, integration of the literature, accommodation model, and seated operator reach profiles [AD-A040479] N77-33857

CONSTRUCTION
Early use of solar energy in buildings. A study of barriers and incentives to the widespread use of solar heating and cooling systems [PB-267832/4] N77-33618
Guidebook on anthropomorphic test dummy usage [PB-268904/0] N77-33865

CONTAMINANTS
Discrete event approach to pollutant transport and vegetation effects
[ORNL-CSD-TM-11] N77-33694
Methods used to estimate air pollutant emissions 1974, 1980, and 2000. New Jersey, New York: Connecticut air quality control region
[PB-269667/2] N77-33706
Upper atmosphere research bibliography of contaminant release experiments, part 3
[AD-A042565] N77-33733
CONTAMINATION
Notes on the pollution of airplanes and helicopters by chemicals during agricultural jobs
[NASA-TT-F-17444] N77-33129
CONTINUOUS WAVE LASERS
A CW HF laser with supersonic premixing and stationary shock initiation
[AD-A041779] N77-33502
CONTINUOUS WAVE RADAR
STDN ranging equipment
[NASA-CR-152603] N77-33257
CONTRACT MANAGEMENT
Major system acquisition: Is a separate spares contract better
[AD-A042775] N77-34033
Impact of competitive procurement on configuration control
[AD-A042876] N77-34034
CONTROL
Spacelab contamination assessment. Payload/orbiter contamination control requirement study
[NASA-CR-150413] N77-33248
CONTROL CONFIGURED VEHICLES
Initial unsteady aerodynamic measurements of a circulation controlled airfoil and an oscillating flow wind tunnel
[AD-A042102] N77-33122
CONTROL STABILITY
Entry dynamics of space shuttle orbiter with longitudinal stability and control uncertainties at supersonic and hypersonic speeds
[NASA-TP-1084] N77-33259
CONTROL SURFACES
Transonic aerodynamic characteristics of a supercritical-wing transport model with trailing-edge controls
[NASA-TM-X-3431] N77-33116
Transonic aerodynamic characteristics of a supercritical-wing transport model with trailing-edge controls, supplement, part 1
[NASA-TM-X-3431-PT-1] N77-33117
Transonic aerodynamic characteristics of a supercritical-wing transport model with trailing-edge controls
[NASA-TM-X-3431-PT-2] N77-33118
Transonic aerodynamic characteristics of a supercritical-wing transport model with trailing edge controls
[NASA-TM-X-3431-PT-3] N77-33119
Transonic aerodynamic characteristics of a supercritical-wing transport model with trailing-edge controls
[NASA-TM-X-3431-PT-4] N77-33120
A magnetic fluid seal for measurement of aerodynamic surface pressure
[AD-A040345] N77-33352
CONTROL THEORY
F-8C adaptive flight control laws
[NASA-CR-2880] N77-33202
Observability and identifiability of nonlinear dynamical systems with an application to the optional control model for the human operator
[AD-A041794] N77-33899
Development of a continuous performance measure for manual control
[AD-A041676] N77-33900
A boundary value control problem for hyperbolic systems
N77-33908
Optimal control of birth and death processes and queues
[AD-A042123] N77-33944
CONTROLLERS
Use of a microprocessor-based interactive system to increase production of printed wiring board artwork
[SAND-77-8503] N77-33431
Development of a stability monitor/controller for material handling equipment. Phase 2: Hardware development
[AD-A041192] N77-33524
CONVECTION
Formulation of approximate equations for modeling moist deep convection on the mesoscale
[PB-267592/4] N77-33756
CONVECTION CURRENTS
Problems related to macroscopic electric fields in the magnetosphere
[TRITA-EPP-77-08] N77-33736
Analysis of cool season lake-related mesoscale phenomena using numerical variational analysis
[PB-269619/3] N77-33771
CONVERGENCE
Improved convergence for linear systems using three-part splittings
[AD-A041729] N77-33914
CONVOLUTION INTEGRALS
A characterization of convoluted geometric distributions
[AD-A042136] N77-33931
COORDINATES
Nonlinear formulation of finite element by corotational coordinates
[ANL-CT-77-9] N77-33548
COPOLYMERS
Crystallization-induced reaction of aromatic copolyesters
N77-33340
The synthesis and characterization of selected copolyoxamides with special emphasis on their complexation behavior
N77-33346
Viscoelastic properties of homogeneous block copolymers
[AD-A042044] N77-33361
COPPER
An electron paramagnetic resonance study of some tetradentate Schiff base complexes of copper [II]
N77-33279
The corrosion kinetics of copper in aqueous amino acid and carboxylic acid solutions
N77-33312
Performance of branch circuit electrical terminations of copper and aluminum non-metallic sheathed cable
[PB-267221/0] N77-33434
COPPER ALLOYS
Mechanism of stress-corrosion cracking
[AD-A042106] N77-33322
COPPER COMPOUNDS
Crystal structure and magnetic studies of bis[mu-dibutylphosphinato] copper [II]
[AD-A041510] N77-34020
CORN
Application of remote sensing in South Dakota to provide accurate inventories of agricultural crops, enhance contrast in photographic products, monitor rangeland habitat loss, map Aspen, and prepare hydrogeologic surveys
[E77-10237] N77-33568
CORRELATION
Threedimensional flow around a fixed transverse cylinder
[AAAF-NT-77-19] N77-33126
Spatial correlation of transionospheric signal-time-delays
[AD-A041447] N77-33241
Ratio between dynamical and thermal dissipation in turbulent flows
[AAAF-NT-77-21] N77-33472
Feasibility study of thermocouple correlation type transit time flowmeter in transient steam-water flow
[TREE-NUREG-1011] N77-33489
CORRELATION COEFFICIENTS
On the reconstruction of the covariance of stationary Gaussian processes observed through zero memory nonlinearities
[AD-A041812] N77-33934
CORRELATION DETECTION
Point source detection in infrared astronomical surveys
[NASA-CR-152004] N77-34061
CORROSION
The corrosion kinetics of copper in aqueous amino acid and carboxylic acid solutions
N77-33312
Cathodic kinetics during corrosion of 5456-H117 aluminum alloy by high velocity sea water
[AD-A041724] N77-33324
Investigation and status report on concentric neutral corrosion of URD extruded cable
[EPRI-EL-362] N77-33327
Corrosion behavior of steel fibrous concrete
[AD-A041339] N77-33538
CORROSION RESISTANCE
Burner rig alkali salt corrosion of several high temperature alloys
[NASA-TM-X-73659] N77-33313
Corrosion behavior of aluminum in water
[Y-DA-7055] N77-33334
CORROSION TESTS
Cathodic kinetics during corrosion of 5456-H117 aluminum alloy by high velocity sea water
[AD-A041218] N77-33320
COSINE SERIES
Results in semi-inner-product spaces and generalized cosine operator functions
N77-33949
COSMIC RAYS
Interplanetary medium data book
[NASA-TM-X-72614] N77-34065
COSMOLOGY
Cosmology and the structure of scientific theory
N77-34064
COST ANALYSIS
Reliability versus cost in operating wide body jet engines
N77-33186
Space station systems analysis study. Part 3: Documentation. Volume 5: Cost and schedule data
[NASA-CR-151520] N77-33239
New model framework and structure and the commonality evaluation model — concerning unmanned spacecraft projects
[NASA-CR-155157] N77-33249
A cost benefit evaluation of the LANDSAT follow-on program
[NASA-CR-155156] N77-33584
Effects of economic development on water resources
[PB-269096/4] N77-33593
Investigation of GaAs solar cell potential performance and cost
[AD-A040736] N77-33612
Coal gasification study
[AD-A041860] N77-33615
Solar energy: Policy and prospects
[PB-267986/8] N77-33620
Design and cost study of a zinc/nickel oxide battery for electric vehicle propulsion
[ANL-K-76-3543-1] N77-33635
A prediction model to forecast the cost impact from a break in the production schedule
[NASA-TM-78131] N77-34044
The art of cost-benefit analysis
[AD-A041756] N77-34045
Life cycle costing: Case studies
[PB-268162/5] N77-34047
COST EFFECTIVENESS
Product improvement program evaluation
[AD-A042134] N77-33101
Space station systems analysis study. Part 3: Documentation. Volume 4: Supporting research and technology report
[NASA-CR-151521] N77-33238
A safety, quality and cost effectiveness study of composition A3 press loading parameters,2
[AD-A041078] N77-33383
COST REDUCTION
Development of low cost, high reliability sealing techniques for hybrid microcircuit packages, phase 2
[NASA-CR-150420] N77-33349
COULOMETRY
A study of the hemin heterogeneous rate constant in non-aqueous solvents with on-line coulostatic system
N77-33275
The coulometric dissolution and electrochemical behavior of titanium anodes in methanol
N77-33276
COUPLING
Coupling through rotationally symmetric apertures in cavities of revolution
[AD-A042093] N77-33390
On the stability of ballooning modes in the boundary layer of a gas insulated plasma
[TRITA-PFU-77-04] N77-34015
COUPLING CIRCUITS
A constant-resistance power divider using single-element couplers and its optimum design for wide bandwidth
N77-33408
COVARIANCE
On the reconstruction of the covariance of stationary Gaussian processes observed through zero memory nonlinearities
[AD-A041812] N77-33934
Dynamics of continua and particles from general covariance of Newtonian gravitation theory
[CNRS-CPT-76-P-849] N77-34029
CRACK PROPAGATION
Fatigue crack growth at elevated temperature 316 stainless steel and H-13 steel
[NASA-CR-135105] N77-33314
Mechanical properties of several nickel alloys in hydrogen at elevated temperatures
[NASA-CR-150412] N77-33315
Reactions and electrochemical kinetics of newly-generated metal surfaces
[AD-A036570] N77-33317
A treatment of the subject of tearing instability
[PB-270277/7] N77-33335
Acoustic emission monitoring of crack propagation on the expedited wing fatigue test article X993
[AD-A041107] N77-33540
CREEP PROPERTIES
Ductility normalized-strainrange partitioning life relations for creep-fatigue life predictions
[NASA-TM-73737] N77-33536
CRITICAL TEMPERATURE
Temperature oscillations at critical temperature in two-phase flow
[ANL-TRANS-1083] N77-33459
CRITICAL VELOCITY
Dynamics of a coaxial plasma gun
[TRITA-EPP-77-02] N77-34014
CROP IDENTIFICATION
Seismotectonic, structural, volcanologic, and geomorphic study of New Zealand; indigenous forest

assessment in New Zealand; mapping, land use, and environmental studies in New Zealand, volume 2
[E77-10234] N77-33565
Application of remote sensing in South Dakota to provide accurate inventories of agricultural crops, enhance contrast in photographic products, monitor rangeland habitat loss, map Aspen, and prepare hydrogeologic surveys
[E77-10237] N77-33568
Application of LANDSAT imagery in land use inventory and classification in Nebraska — Lower and Upper Niobrara area and Sheridan County
[E77-10242] N77-33573

CROSS CORRELATION
Identification and measurement of combustion noise from a turbofan engine using correlation and coherence techniques
[NASA-TM-73747] N77-33162
Correlation analysis of flow velocity fluctuations in a subsonic free jet
[ISL-R-134/76] N77-33469

CROSS SECTIONS
Displacement cross sections and PKA spectra: Tables and applications
[HEDL-TME-76-70] N77-33332

CROSSED FIELD AMPLIFIERS
Low cost crossed-field amplifier
[AD-A042666] N77-33425

CRUDE OIL
Alternate petroleum based fuels for naval fleet usage: potential availability, cost, and system impact
[AD-A041980] N77-33372
An economic model of new crude oil and natural gas supplies in the lower 48 states
N77-33596

CRUSTAL FRACTURES
Thaumasia: A fossilized, early-forming Tharsis uplift
[NASA-TM-X-71404] N77-33710

CRUSTS
The shapes of marine magnetic anomalies: Paleomagnetic field behavior, paleomagnetic poles and ridge crest processes
N77-33716

CRYOGENIC ROCKET PROPELLANTS
Vapor ingestion in Centaur liquid-hydrogen tank
[NASA-TP-1061] N77-33444

CRYOGENICS
Thermal energy storage demonstration unit for Vuilleumier cryogenic cooler
[AD-A040895] N77-33613

CRYSTAL DISLOCATIONS
Electron-dislocation interaction at low temperatures
[COO-2305-4] N77-34026

CRYSTAL GROWTH
Magneto-optic development for laser beam steering
[AD-A042985] N77-33509
Purification, controlled doping and crystal growth of II-VI compound semiconductors
[AD-A041753] N77-34025

CRYSTAL LATTICES
Lattice dynamics and intermolecular potentials for hydrocarbons
N77-34017

CRYSTAL OSCILLATORS
Tactical miniature crystal oscillator
[AD-A041411] N77-33436

CRYSTAL STRUCTURE
Structure analyses of several organic compounds using X-ray crystallographic techniques
N77-33286
Directional solidification of polymers in a temperature gradient
N77-33344
Crystal structure and magnetic studies of bis[mu-dibutylphosphinato] copper [II]
[AD-A041510] N77-34020

CRYSTAL SURFACES
Friction and deformation behavior of single-crystal silicon carbide
[NASA-TP-1053] N77-33350

CRYSTALLIZATION
Crystallization-induced reaction of aromatic copolyesters
N77-33340
Creep and relaxation behavior of vapor-deposited amorphous selenium films: Flow behavior of glassy metals
[AD-A041111] N77-34021

CRYSTALLOGRAPHY
Structure analyses of several organic compounds using X-ray crystallographic techniques
N77-33286
Studies of crystal field, temperature, and concentration effects on the lowest triplet states of aromatic molecules in mixed single crystals
N77-33292

CUES
Effects of visual propioceptive cue conflicts on human tracking performance
[AD-A042006] N77-33860

CUMULUS CLOUDS
Formulation of approximate equations for modeling moist deep convection on the mesoscale
[PB-267592/4] N77-33756

CURING
Synthesis of polyimides curable by intramolecular cycloaddition
[AD-A041420] N77-33355

CURRENT REGULATORS
Study of the auxiliaries for lead-acid battery systems for peaking power
[CONS/2114-3] N77-33634

CUTTERS
Optical fiber cutting machine for rectangular and circular fibers
[AD-A041506] N77-33521

CUTTING
Temperature measurement of a cutting torch flame containing TiO2- and SiO2-particles
[ISL-R-123/76] N77-33491

CYCLIC HYDROCARBONS
Synthesis of polyimides curable by intramolecular cycloaddition
[AD-A041420] N77-33355

CYCLONES
Simulation and analysis of a tropical cyclon warning system
[AD-A042659] N77-33757
Atlantic tropical and subtropical cyclone classification for 1976
[PB-269674/8] N77-33768

CYLINDRICAL BODIES
Wundy calculations of the collapse velocities of a staged imploding cylinder
[AD-A041064] N77-33541

CYLINDRICAL SHELLS
Study of electric explosion of cylindrical foils in air
[UCRL-TRANS-11227] N77-33429

CYTOLOGY
The response of single human bells to zero-gravity
N77-33805

D

DAMPERS [VALVES]
Steady-state unbalance response of a three-disk flexible rotor on flexible, damped supports
[NASA-TM-X-73666] N77-33160

DATA ACQUISITION
An accurate angular position and angular velocity instrument based on an optical incremental encoder
[WRE-TN-1730[WR/D]] N77-33480
Development and construction of the small data acquisition system MINIDIG — for use on motor gliders ASK 16
[DLR-IB-553-76/6] N77-33492
Transparent materials processing system
[NASA-CR-150411] N77-33516
Assessment of service requirements and design characteristics of present and future paratransit vehicles
[PB-267574/2] N77-33699
Methods used to estimate air pollutant emissions 1974, 1980, and 2000. New Jersey, New York: Connecticut air quality control region
[PB-269667/2] N77-33706

DATA BASES
Data Processing for the S3 satellites
[AD-A041912] N77-33243
Accounting systems for energy conservation
[LA-6569-MS] N77-33646
The BIOSIS data base: Evaluation of its indexes and the STRATBLDR, CHEMFILE, STAIRS and DIALOG systems for on-line searching
[NASA-CR-2893] N77-33869
Architecture of the BNL archive and dissemination system
[BNL-22445] N77-34038

DATA CORRELATION
Energy interrelationships. A handbook of tables and conversions factors for combining and comparing international energy data
[PB-269034/5] N77-33675

DATA LINKS
Time division multiplex frame synchronization: Acquisition, maintenance and reacquisition
[AD-A041384] N77-33435

DATA MANAGEMENT
Earth resources-regional transfer activity contracts review
[NASA-TM-78130] N77-33578
A user's guide to the System/3 data base management system [S3DBMS]
[PB-268875/2] N77-33874

DATA PROCESSING
Satellite to satellite tracking error analysis studies and data processing
[NASA-CR-144832] N77-33237
Data Processing for the S3 satellites
[AD-A041912] N77-33243
Safety information system guide
[ERDA-76-45/9] N77-33384
Processing of photographical data for analysis of target deformation in terminal ballistics experiments
[ISL-CO-201/76] N77-33494
Space studies of earth resources: Methods and means of measurements and processing of information
[NASA-TT-F-17544] N77-33583
Tornado detection data reduction and analysis
[NASA-CR-152595] N77-33742
Development of a hydrologic information storage and retrieval system
[PB-268792/9] N77-33765
US national processing center for GATE: B-scale surface meteorological and radiation system, including instrumentation, processing, and archived data
[PB-268816/6] N77-33766
GATE convection subprogram data center: Comparison of ship-surface, rawinsonde, and tethered sonde wind measurements
[PB-268848/9] N77-33767
Computer technology in materials analysis. Part 1: Metals and alloys
[AD-A041031] N77-33877
DOVE, a rational analysis of sparse data
[AD-A042638] N77-33886
The division of information processing labor between user and support system: Exploration of a concept
N77-34035

DATA REDUCTION
An analysis of earthquake frequency data
[AD-A035813] N77-33722

DATA SAMPLING
Investigation of environmental change pattern in Japan. Investigation of the ecological environment index from observation of the regional vegetation cover and their growing condition
[E77-10244] N77-33575
Bayesian decision theory in variables sampling for quality control
[AD-A042117] N77-33930

DATA SYSTEMS
Critical evaluation of data in the physical sciences. A status report on the national standard reference data system, January 1977
[PB-268513/9] N77-34040

DATA TRANSMISSION
State of the art in fiber optics communications and data transfer
[AD-A042579] N77-33398

DAYTIME
The energy balance of the nighttime thermosphere
[NASA-CR-155194] N77-33721

DC 9 AIRCRAFT
Behavior of aircraft antiskid breaking systems on dry and wet runway surfaces: A slip-ratio-controlled system with ground speed reference from unbraked nose wheel
[NASA-TN-D-8455] N77-33150

DECISION MAKING
Integrated study plan for space bioprocessing [phase 1]
[NASA-CR-155170] N77-33221
Public participation in energy related decision making, edited transcripts
[PB-268781/2] N77-33674
Reflections of regional environmental systems
[ORNL-RUS-26] N77-33695
Bayesian decision theory in variables sampling for quality control
[AD-A042117] N77-33930
An interactive computer aiding system for group decision making
[AD-A041758] N77-34030
The art of cost-benefit analysis
[AD-A041756] N77-34045
Accessibility applications in urban transportation
[PB-269240/8] N77-34059

DECISION THEORY
Practical use of decision theory to assess uncertainties about actions affecting the environment
[PB-269011/3] N77-33702
Minimax subset selection with applications to unequal variance problems
[AD-A041744] N77-33917
Decision problems in the fundamental groups of 3-manifolds
N77-33950
An interactive computer aiding system for group decision making
[AD-A041758] N77-34030

DECODERS
Reduced state viterbi detector demonstration
[AD-A041712] N77-33396

DEEP SPACE NETWORK
Tracking and data system support for the Viking 1975 mission to Mars. Volume 3: Planetary operations
[NASA-CR-155168] N77-33229

DEFENSE COMMUNICATIONS SYSTEM [DCS]
System integration and interface transition issues
[AD-A041457] N77-33393

DEFORMATION
Deformation behaviour of Ti-50.3 at Ni alloy
[LBL-5103] N77-33331
Rheoptical studies of blends of poly [styrene-b-butadiene-b-styrene] and polystyrene
[AD-A042045] N77-33362
Processing of photographical data for analysis of target deformation in terminal ballistics experiments
[ISL-CO-201/76] N77-33494

DEGENERATION
Study of metabolism and energetics in hypogravity: Degenerative effects of prolonged hypogravity
[NASA-CR-155199] N77-33839

DELAY
Average delay in queues with nonstationary Poisson arrivals
[AD-A041629] N77-33932

DELTA MODULATION
Communication system analysis for manned space flight
[NASA-CR-151508] N77-33388

DELTA WINGS
Three dimensional steady and unsteady asymmetric flow past wings of arbitrary planforms
[NASA-CR-145235] N77-33102

DENTAL CALCULI
Skylab oral health studies
N77-33786

DEPENDENT VARIABLES
Space and time evolution of two nonlinearly coupled variables: Special solutions
[IPPJ-273] N77-33910

DEPTH
Greatest known areal storm rainfall depths for the contiguous United States
[PB-268871/1] N77-33759

DERIVATION
Apriori estimates of higher order derivatives of solutions to the FitzHugh-Magumo equations
[AD-A042694] N77-33922

DESIGN ANALYSIS
Technical and economic assessment of swept-wing span-distributed load concepts for civil and military air cargo transports
[NASA-CR-145229] N77-33147
Design considerations in mechanical face seals for improved performance. 2: Lubrication
[NASA-TM-73736] N77-33518
Design and fabrication of termination boots for mechanical/electromechanical cable terminations
[AD-A041857] N77-33526
Evaluation of design safety factors for time-dependent buckling
[SAND-76-0721] N77-33547
Design definition of a mechanical capacitor
[NASA-CR-152613] N77-33603
Design and cost study of a zinc/nickel oxide battery for electric vehicle propulsion
[ANL-K-76-3543-1] N77-33635
Planning and design of additional East Mesa Geothermal Test Facilities. Phase 1B, Volume 2: Procurement package
[SAN/1140-1/2-VOL-2] N77-33657
Design guidelines for energy conserving systems
[PB-268989/1] N77-33670
Assessment of service requirements and design characteristics of present and future paratransit vehicles
[PB-267574/2] N77-33699

DESORPTION
Laser induced desorption of gas from stainless steel surfaces
[AD-A042323] N77-33325

DESULFURIZING
Overview and review of motor gasoline desulfurization, volume 1
[BERC/RI-76/17-VOL-1] N77-33377
Motor gasoline desulfurization study, volume 2
[BERC/RI-76/17-VOL-2] N77-33378
Evaluation of the disposal of flue gas desulfurization wastes in mines and the ocean: Initial assessment
[PB-269270/5] N77-34058

DETECTORS
Superconducting magnetic calibration source for magnetic anomaly detection MAD operations
[AD-A041738] N77-33421
US national processing center for GATE: B-scale surface meteorological and radiation system, including instrumentation, processing, and archived data
[PB-268816/6] N77-33766

DETONATION
Mass spectrometric measurement of velocity distributions of nitrogen molecules in the expansion gas of lead azide after ultrahigh vacuum detonation
[ISL-R-108/76] N77-33308
Direct initiation of detonation by non-ideal blast waves
[AD-A042811] N77-33454

DETONATION WAVES
Wundy calculations of the collapse velocities of a staged imploding cylinder
[AD-A041064] N77-33541

DEVELOPING NATIONS
Role of renewable energy technologies in developing countries
[BNL-22311] N77-33638

DEW
Carbon dioxide/dewpoint monitor
N77-33833

DF LASERS
A hydrogen fluoride/deuterium flouride laser at the Naval Postgraduate School
[AD-A042341] N77-33505

DIBUTYL COMPOUNDS
Crystal structure and magnetic studies of bis[mu-dibutylphosphinato] copper [II]
[AD-A041510] N77-34020

DIELECTRICS
Dielectric constants, pair interactions and molecular shape of polar molecules
N77-33293
Surface charge kinetics near metal-dielectric interfaces exposed to kiloyolt electron flux
[NASA-CR-155195] N77-33411

DIFFERENCE EQUATIONS
Non-standard partial difference equations
N77-33907

DIFFERENTIAL EQUATIONS
EPISODE: An effective package for the integration of systems of ordinary differential equations --- including boundary value problems
[UCID-30112-REV-1] N77-33925
A differential for L-statistics
[AD-A042683] N77-33936

DIFFRACTION
The theory of diffraction from a holographic lens
[AD-A041537] N77-33486

DIFFRACTION PATTERNS
An improved formulation for extending the geometrical theory of diffraction by the moment method
[AD-A041775] N77-33972

DIFFRACTOMETERS
Geometrical problems with a position sensitive detector employed on a diffractometer: Its use in the measurement of stress
[AD-A041102] N77-33484

DIFFUSION
Polymer-solvent interactions and diffusion in constrained elastomers
N77-33337

DIFFUSION COEFFICIENT
Theoretical investigation of anomalous properties of BCC, Ti, Zr, and Hf alloys
[AD-A042108] N77-33323

DIGESTIVE SYSTEM
Activity of the digestive system during 49-day antiorthostatic human hypokinesia
[NASA-TM-75177] N77-33846

DIGITAL COMPUTERS
CSKYTI: An out-of-core Cholesky algorithm equation solver [with respect to profile] for the Texas Instruments' Advanced Scientific computer
[AD-A042807] N77-33923
Areal mapping of arbitrary plane regions onto rectangular meshes
[UCID-17415] N77-33926

DIGITAL DATA
Air traffic control experimentation and evaluation test
[AD-A041971] N77-33136
Seismotectonic, structural, volcanologic, and geomorphic study of New Zealand; indigenous forest assessment in New Zealand; mapping, land use, and environmental studies in New Zealand, volume 2
[E77-10234] N77-33565
Evaluation of Ocean Color Scanner [OCS] photographic and digital data: Santa Barbara Channel test site, 29 October 1975 overflight
[NASA-CR-155171] N77-33587

DIGITAL FILTERS
Digital filtering using burst processing techniques
[AD-A042657] N77-33424

DIGITAL SIMULATION
Assessment of a dynamical gyroscope model utilizing digital simulation techniques
[AD-A042497] N77-33488

DIGITAL SYSTEMS
Digital flight control systems
[NASA-CR-145246] N77-33200
Analysis of inherent errors in asynchronous digital flight controls
[AD-A041813] N77-33206
Use of a microprocessor-based interactive system to increase production of printed wiring board artwork
[SAND-77-8503] N77-33431
High bit rate digital recorder
[AD-A041320] N77-33485
Ultraprecise parabolic interpolator for numerically controlled machine tools
[REPT-40004] N77-33529

DIMENSIONAL MEASUREMENT
Applications of the dimensional-measuring laser interferometer in the Oak, Ridge Y-12 Plant Gage Laboratory
[Y-2070] N77-33510

DISCRETE FUNCTIONS
Review of finite fields: Applications to discrete Fourier, transforms and Reed-Solomon coding
[NASA-CR-155167] N77-33875

DISPERSING
Atmospheric dispersion characteristics in the Louisiana coastal zone
[AD-A041099] N77-33747

DISPLAY DEVICES
Master monitor display application study for F-14
[AD-A041570] N77-33158
Processing of photographical data for analysis of target deformation in terminal ballistics experiments
[ISL-CO-201/76] N77-33494
Optical analysis of a multicolor model of the 360 degree nonprogrammed visual display
[AD-A042092] N77-33499
A review of the literature on the legibility of alphanumerics on electronic displays
[AD-A040625] N77-33856
Manufacturing methods and engineering for TFT addressed display
[AD-A041754] N77-34022

DISSOCIATION
Collisional dissociation and structural properties of atmospheric negative ions
[AD-A042111] N77-33730

DISTANCE MEASURING EQUIPMENT
Monte Carlo simulation of VOR/DME holding procedures. Basic notions and applications
[ESA-TT-419] N77-33142

DISTORTION
Seismotectonic, structural, volcanologic, and geomorphic study of New Zealand; indigenous forest assessment in New Zealand; mapping, land use, and environmental studies in New Zealand, volume 2
[E77-10234] N77-33565

DISTRIBUTION FUNCTIONS
On differentials, asymptotic normality and almost sure behavior of statistical functions, with application to M-statistics for location parameters
[AD-A042661] N77-33935

DIURNAL VARIATIONS
Positive ions in the middle atmosphere during sunrise conditions
[AD-A041799] N77-33732

DOCUMENTS
Review policies and their effect on journal quality
[PB-267602/1] N77-34039
Trends in Scholarly Publishing
[BLL-BLRDR-5299-[2113.56F]] N77-34043

DOPED CRYSTALS
Purification, controlled doping and crystal growth of II-VI compound semiconductors
[AD-A041753] N77-34025

DOPPLER NAVIGATION
The application of the Kalman-Bucy filter theory to the design of feedback networks for Doppler supported inertial navigation systems in flight
[DLR-IB-552-75/18] N77-33141

DOPPLER RADAR
STDN ranging equipment
[NASA-CR-152603] N77-33257

DRAINAGE
Snowmapping in southern Norway by use of LANDSAT imagery
[E77-10241] N77-33572

DRIFT RATE
Nonlinear heat and particle transport due to collisional drift waves
[IPPJ-281] N77-33996

DUCTILITY
Ductility normalized-strainrange partitioning life relations for creep-fatigue life predictions
[NASA-TM-73737] N77-33536

DUMMIES
Guidebook on anthropomorphic test dummy usage
[PB-268904/0] N77-33865

DUST
Boundary layer dust occurrence. 4: Atmospheric dust over selected geographical areas
[AD-A041077] N77-33726

DUST STORMS
Boundary layer dust occurrence. 4: Atmospheric dust over selected geographical areas
[AD-A041077] N77-33726

DYNAMIC CONTROL
Observability and identifiability of nonlinear dynamical systems with an application to the optional control model for the human operator
[AD-A041794] N77-33899

DYNAMIC MODELS
Assessment of a dynamical gyroscope model utilizing digital simulation techniques
[AD-A042497] N77-33488
Error behavior of multistep methods applied to unstable differential systems
[NASA-CR-155169] N77-33941

DYNAMIC PROGRAMMING
Region tracking using dynamic programming
[AD-A041908] N77-33902
On the average number of maxima in a set of vectors and applications
[AD-A042597] N77-33918
Detecting the shift in the probability of success in a series of Bernoulli trails
[AD-A042739] N77-33940

DYNAMIC RESPONSE
Structural Aspects of Active Controls
[AGARD-CP-228] N77-33208
Impact of a command and stability augmentation system on gust response of a combat aircraft
N77-33210

Static and dynamic response calculations for the new Coulport launcher piston assembly
[NCRE/N206] N77-33534
On dynamic plastic mode form solutions
[AD-A042361] N77-33543
Secondary sources of seismic noise
N77-33714
PROMETHEUS 2: A user oriented program for human crash dynamics
[PB-269305/9] N77-33866

DYNAMIC STABILITY
Handling qualities of the RH-53D in the design growth configuration
[SER-651317] N77-33144

E

E-4A AIRCRAFT
A flight investigation of the wake turbulence alleviation resulting from a flap configuration change on a B-747 aircraft
[NASA-TM-73263] N77-33130

EAR PROTECTORS
Noise induced hearing loss. Noise evaluation. The use of hearing protectors
[NTNF-4] N77-33852
Frequency dependence of impulse noise attenuation — hazard to hearing
[AD-A042031] N77-33961

EARTH (PLANET)
The application of ERTS imagery to the FAO/Unesco soil map of the world
[E77-10236] N77-33567
Solar activity and a global survey of precipitation
N77-33743

EARTH ATMOSPHERE
Satellite inferred surface albedo over northwestern Africa
[PB-267835/7] N77-33740

EARTH CORE
Theoretical seismograms of code phases calculated by a frequency-dependent full wave theory, and their interpretation
N77-33715

EARTH RESOURCES
Literature review of the remote sensing of natural resources — bibliography
[NASA-CR-155190] N77-33551
Earth resources-regional transfer activity contracts review
[NASA-TM-78130] N77-33578
Space studies of earth resources: Methods and means of measurements and processing of information
[NASA-TT-F-17544] N77-33583
A cost benefit evaluation of the LANDSAT follow-on program
[NASA-CR-155156] N77-33584
Role of renewable energy technologies in developing countries
[BNL-22311] N77-33638

EARTH RESOURCES PROGRAM
Spinoff 1977: An annual report
[NASA-TM-74908] N77-34049

EARTHQUAKE RESISTANT STRUCTURES
Guidelines for evaluating the seismic resistance of existing buildings
[AD-A042873] N77-33546

EARTHQUAKES
Secondary sources of seismic noise
N77-33714
An analysis of earthquake frequency data
[AD-A035813] N77-33722
Plate tectonics and the discrimination of underground explosions from earthquakes
[AD-A041904] N77-33729

ECOLOGY
Investigation of environmental change pattern in Japan. Investigation of the ecological environment index from observation of the regional vegetation cover and their growing condition
[E77-10244] N77-33575
Interagency energy/environment research and development program: Status report 3
[PB-267443/0] N77-33662

ECONOMIC ANALYSIS
Integrated study plan for space bioprocessing [phase 1]
[NASA-CR-155170] N77-33221
Standard spacecraft economic analysis. Volume 1: Executive summary
[NASA-CR-152538] N77-33224
Standard spacecraft economic analysis. Volume 2: Findings and conclusions
[NASA-CR-152539] N77-33225
Technical and economic studies of small reactors for supply of electricity and steam
[IAEA-CN-36/398] N77-33678
The stochastic formulation of a modified cobweb model
[AD-A042737] N77-34046

ECONOMIC DEVELOPMENT
Effects of economic development on water resources
[PB-269096/4] N77-33593

ECONOMIC FACTORS
Improved engineering-economic model of residential energy use
[ORNL-CON-8] N77-33644
Weather forecasting and weather forecasts: Models, systems and users. Volume 2: Notes from a colloquium
[PB-268914/9] N77-33775
Weather forecasting and weather forecasts: Models, systems, and users. Volume 1: Notes from a colloquium
[PB-268913/1] N77-33776

ECONOMICS
An economic model of new crude oil and natural gas supplies in the lower 48 states
N77-33596
The economic determinants of waste oil recycling
N77-33597
The stochastic formulation of a modified cobweb model
[AD-A042737] N77-34046

ECOSYSTEMS
Application of remote sensing in South Dakota to provide accurate inventories of agricultural crops, enhance contrast in photographic products, monitor rangeland habitat loss, map Aspen, and prepare hydrogeologic surveys
[E77-10237] N77-33568
TEHM: A Terrestrial Ecosystem Hydrology Model
[EDFB-IBP-76-8] N77-33592

EDGES
A method of adaptive smoothing and edge enhancement — for image processing
[AD-A041909] N77-33898

EDUCATION
Promoting energy conservation through occupational licensure: A feasibility study
[LBL-5996] N77-33647

EFFECTIVE PERCEIVED NOISE LEVELS
The effect of psychophysical method on the loudness of continuous and interrupted pure tones
N77-33954

EFFICIENCY
Investigation of GaAs solar cell potential performance and cost
[AD-A040736] N77-33612

ELASTIC DEFORMATION
Nonlinear aeroelastic equations for combined flapwise bending, chordwise bending, torsion, and extension of twisted nonuniform rotor blades in forward flight
[NASA-TM-74059] N77-33107
Friction and deformation behavior of single-crystal silicon carbide
[NASA-TP-1053] N77-33350

ELASTIC PLATES
Elastic plate buckling using finite elements
[NCRE/R627] N77-33532

ELASTIC PROPERTIES
Design and fabrication of termination boots for mechanical/electromechanical cable terminations
[AD-A041857] N77-33526
Applications of the extremal principles of elasticity to the determination of stress intensity factors
[AD-A042669] N77-33545

ELASTOHYDRODYNAMICS
Dynamical shear and structural viscoelasticity in elastohydrodynamic lubrication
[AD-A041665] N77-33365
Analysis of film thickness effect in slow-speed lightly-loaded elastrohydrodynamic contacts. Part 3: Experimental measurement of lubricant film thickness
[AD-A041205] N77-33522

ELASTOMERS
Polymer-solvent interactions and diffusion in constrained elastomers
N77-33337

ELECTRIC ARCS
Development of current limiter using vacuum arc current commutation. Phase 1: A feasibility study for using arc instability in vacuum for current limitation
[EPRI-EL-393] N77-33427

ELECTRIC BATTERIES
Redox bulk energy storage system study, volume 1
[NASA-CR-135206-VOL-1] N77-33608
Redox bulk energy storage system study, volume 2
[NASA-CR-135206-VOL-2] N77-33609
Study of the auxiliaries for lead-acid battery systems for peaking power
[CONS/2114-3] N77-33634

ELECTRIC CONDUCTORS
Analysis of wire antennas in the presence of a conducting half space. Part 3: The buried antenna
[UCRL-52228] N77-33400

ELECTRIC CURRENT
Repetitive series interrupter II
[AD-A041144] N77-33419
Development of current limiter using vacuum arc current commutation. Phase 1: A feasibility study for using arc instability in vacuum for current limitation
[EPRI-EL-393] N77-33427
Performance of branch circuit electrical terminations of copper and aluminum non-metallic sheathed cable
[PB-267221/0] N77-33434

ELECTRIC ENERGY STORAGE
Redox bulk energy storage system study, volume 1
[NASA-CR-135206-VOL-1] N77-33608
Redox bulk energy storage system study, volume 2
[NASA-CR-135206-VOL-2] N77-33609

ELECTRIC FIELDS
Conversion of computer software for the gimballed electrostatic gyro navigation system, volume 1
[AD-A041711] N77-33138
Field ionization for laser isotope separation
[EPRI-NP-334] N77-33512
Problems related to macroscopic electric fields in the magnetosphere
[TRITA-EPP-77-08] N77-33736
Electric field topology near the dayside magnetopause
[TRITA-EPP-77-12] N77-33737
Criticism of reconnection models of the magnetopause
[TRITA-EPP-77-13] N77-33738

ELECTRIC GENERATORS
Feasibility study of a 400 Hz, 4160 volt 3-phase electrical power distribution system
[AD-A042042] N77-33422
Design and development of a major engine component [compressor] for a 60 kW turbine generator set
[AD-A041717] N77-33525

ELECTRIC MOTOR VEHICLES
Design and cost study of a zinc/nickel oxide battery for electric vehicle propulsion
[ANL-K-76-3543-1] N77-33635

ELECTRIC POTENTIAL
Sealed primary lithium-inorganic electrolyte cell
[AD-A036172] N77-33611

ELECTRIC POWER PLANTS
Thermal energy storage demonstration unit for Vuilleumier cryogenic cooler
[AD-A040895] N77-33613
Technical and economic feasibility of solar augmentation for boiler feedwater heating in steam-electric power plants
[COO-2864-1] N77-33626
Application of the Alsthom/Exxon alkaline fuel cell system to utility power generation
[EPRI-EM-384] N77-33643
Systems engineering for power
[ERDA-77-37] N77-33651
K-area boiler-turbine alternator. Validation tests and validation project
[BNWL-2168] N77-33653
Evaluation of stationary source particulate measurement methods. Volume 2: Oil-fired steam generators
[PB-269081/6] N77-33705
Evaluation of the disposal of flue gas desulfurization wastes in mines and the ocean: Initial assessment
[PB-269270/5] N77-34058

ELECTRIC POWER SUPPLIES
Analysis and forecast of electrical distribution system materials. Volume 3: Appendix
[CONS/2050-1-VOL-3-APP] N77-33430
State environmental issues series. Energy conservation. Policy considerations for the states
[PB-267857/1] N77-33663
Incentives for the commercialization of Ocean Thermal Energy Conversion Technology [OTEC]
[PB-268097/3] N77-33665
Incentives for the commercialization of Ocean Thermal Energy Conversion technology [OTEC], executive summary
[PB-268096/5] N77-33666
Report of the Advisory Commission on Electric Power Alternatives
[PB-268479/3] N77-33668

ELECTRIC POWER TRANSMISSION
Experiment support system
N77-33831

ELECTRICAL FAULTS
Study on RF voltage breakdown for LHRH in 0.8 - 0.9 GHz
[IPPJ-J-27] N77-33998

ELECTRICAL INSULATION
Program to evaluate, develop, and test poroplastic materials as improved electrical insulation for high power underground cables
[EPRI-EL-312] N77-33433

ELECTRICAL PROPERTIES
Electrical 2-omega-cm 0.046-cm-thick silicon solar cells as a function of intensity and temperature
[NASA-CR-155166] N77-33604

ELECTROCHEMISTRY
Studies of the mechanism of AgCl/Ag electrode reaction
N77-33274
A study of the hemin heterogeneous rate constant in non-aqueous solvents with on-line coulostatic system
N77-33275
The coulometric dissolution and electrochemical behavior of titanium anodes in methanol
N77-33276
Simultaneous reactions on a rotating-disk electrode
[LBL-6094] N77-33305

An assessment of the linkage of research in electrochemistry with its ramifications for industry
[PB-269224/2] N77-33311
Reactions and electrochemical kinetics of newly-generated metal surfaces
[AD-A036570] N77-33317
Electromechanical machining
[AD-A042545] N77-33527
Review of electrochemical impregnation for nickel cadmium cells --- aerospace applications
[NASA-CR-155155] N77-33601

ELECTRODEPOSITION
Review of electrochemical impregnation for nickel cadmium cells --- aerospace applications
[NASA-CR-155155] N77-33601

ELECTRODES
Studies of the mechanism of AgCl/Ag electrode reaction
N77-33274
Simultaneous reactions on a rotating-disk electrode
[LBL-6094] N77-33305

ELECTRODYNAMICS
Solid state optics
[AD-A041822] N77-34024

ELECTROENCEPHALOGRAPHY
Recovery of middle components of human auditory averaged electroencephalic response
N77-33953

ELECTROLYTES
Sealed primary lithium-inorganic electrolyte cell
[AD-A036172] N77-33611

ELECTROMAGNETIC COMPATIBILITY
Coupling through rotationally symmetric apertures in cavities of revolution
[AD-A042093] N77-33390

ELECTROMAGNETIC FIELDS
Interaction of a rectangular ferrite slab with magnetic fields
[AD-A041944] N77-33386
Coupling through rotationally symmetric apertures in cavities of revolution
[AD-A042093] N77-33390

ELECTROMAGNETIC PULSES
Adiabatic oscillations of the one-dimensional SGEMP boundary layer
[AD-A041960] N77-34008

ELECTROMAGNETIC RADIATION
Electromagnetic plasma wave emissions from the auroral field lines
[NASA-CR-155172] N77-33387
Biologic effects of electric and magnetic fields associated with proposed project Seafarer
[AD-A042515] N77-33399
Biological effects of electromagnetic waves. Selected papers of the USNC/URSI Annual Meeting, volume 2
[PB-268095/7] N77-33853

ELECTROMAGNETIC SHIELDING
Advanced composites: Electromagnetic properties, vulnerabilities, and protective measures
[AD-A042043] N77-33272

ELECTROMAGNETIC WAVE TRANSMISSION
Special evaluation report on TACAN propagation
[AD-A041191] N77-33134

ELECTROMECHANICS
Evaluation of the electromechanical properties of the cardiovascular system after prolonged weightlessness
N77-33814

ELECTRON BEAMS
Equilibrium of REB-ring with soft-core
[IPPJ-260] N77-33978

ELECTRON DENSITY (CONCENTRATION)
Investigations of small scale structure of ionisation in the D region using a Langmuir probe
[WRE-TR-1816(W)] N77-33718

ELECTRON DISTRIBUTION
Microinstabilities in a plasma slab with steep density gradient
[IPPJ-294] N77-34002

ELECTRON ENERGY
Particle simulation on the propagation and plasma heating of the lower hybrid wave in the nonuniform system
[IPPJ-296] N77-34004

ELECTRON MICROSCOPES
Sintering of Al2O3 powder compact by hot stage scanning electron microscopy
[LBL-5763] N77-33330

ELECTRON OSCILLATIONS
Electron-dislocation interaction at low temperatures
[COO-2305-4] N77-34026

ELECTRON PARAMAGNETIC RESONANCE
An electron paramagnetic resonance study of some tetradentate Schiff base complexes of copper (II)
N77-33279

ELECTRON TRANSFER
Biological solar energy conversion: Approaches to overcome yield, stability and product limitations
[PB-267937/1] N77-33619

ELECTRON TUBES
Low cost crossed-field amplifier
[AD-A042666] N77-33425

ELECTRONIC COUNTERMEASURES
Extended bandwidth VTS-5753B1 coupled cavity traveling wave tube
[AD-A041564] N77-33417

ELECTRONIC MODULES
Manufacturing methods and techniques for miniature high voltage hybrid multiplier modules
[AD-A041765] N77-33423

ELECTRONS
Surface charge kinetics near metal-dielectric interfaces exposed to kilovolt electron flux
[NASA-CR-155195] N77-33411

ELECTROSTATIC PROBES
Investigations of small scale structure of ionisation in the D region using a Langmuir probe
[WRE-TR-1816(W)] N77-33718

ELECTROSTATIC WAVES
Parametric decay of lower hybrid wave into drift waves
[IPPJ-272] N77-33988

ELLIPSOIDS
The numerical calculation of steady inviscid supercritical flow past ellipsoids without circulation
[AD-A041016] N77-33453

EMISSION SPECTRA
Computer technology in materials analysis. Part 1: Metals and alloys
[AD-A041031] N77-33877

ENCAPSULATING
Investigation of test methods, material properties and processes for solar cell encapsulants
[NASA-CR-155158] N77-33347

ENERGY BUDGETS
The energy balance of the nighttime thermosphere
[NASA-CR-155194] N77-33721

ENERGY CONSERVATION
Alternate petroleum based fuels for naval fleet usage: potential availability, cost, and system impact
[AD-A041980] N77-33372
An approach for managing an energy conservation program
[AD-A041086] N77-33614
US energy flow in 1976
[UCID-17443] N77-33639
Analysis of the California energy industry
[LBL-5928] N77-33640
Design report for the ACES demonstration house
[ORNL-CON-1] N77-33641
Accounting systems for energy conservation
[LA-6569-MS] N77-33646
Promoting energy conservation through occupational licensure: A feasibility study
[LBL-5996] N77-33647
Program plan for ERDA's participation in the IEA working party on energy conservation research and development
[ERDA-77-57] N77-33648
Building energy handbook. Volume 1: Methodology for energy survey and appraisal
[ERDA-76-163/1-VOL-1] N77-33658
State environmental issues series. Energy conservation. Policy considerations for the states
[PB-267857/1] N77-33663
Window design strategies to conserve energy
[PB-269297/8] N77-33669
Energy policy decisionmaking, organization, and national energy goals
[PB-269299/4] N77-33671
Building energy conservation programs: A preliminary examination of regulatory activities at the state level
[PB-268873/7] N77-33673
Preliminary design study of a baseline MIUS
[NASA-TM-X-58193] N77-34050

ENERGY CONSUMPTION
An economic model of new crude oil and natural gas supplies in the lower 48 states
N77-33596
An approach for managing an energy conservation program
[AD-A041086] N77-33614
US energy flow in 1976
[UCID-17443] N77-33639
Improved engineering-economic model of residential energy use
[ORNL-CON-8] N77-33644
Report of the Advisory Commission on Electric Power Alternatives
[PB-268479/3] N77-33668
Energy statistics: A supplement to the summary of national transportation statistics
[PB-269301/8] N77-33672
World energy supply and demand and the future of nuclear power
[IAEA-CN-36/583] N77-33680

ENERGY CONVERSION
The President's energy program
[GPO-88-556] N77-33599
Solid polymer electrolyte [SPE] fuel cell technology program, phase 1/1A — design and fabrication
[NASA-CR-151506] N77-33605
Solid polymer electrolyte [SPE] fuel cell technology program, phase 2/2A — testing and evaluations
[NASA-CR-151507] N77-33606
Biological solar energy conversion: Approaches to overcome yield, stability and product limitations
[PB-267937/1] N77-33619

ENERGY CONVERSION EFFICIENCY
Electrical 2-omega-cm 0.046-cm-thick silicon solar cells as a function of intensity and temperature
[NASA-CR-155166] N77-33604

ENERGY DISSIPATION
Vortex interactions and decay in aircraft wakes
[NASA-CR-2870] N77-33105

ENERGY POLICY
Analysis and forecast of electrical distribution system materials. Volume 3: Appendix
[CONS/2050-1-VOL-3-APP] N77-33430
The President's energy program
[GPO-88-556] N77-33599
Review of electrochemical impregnation for nickel cadmium cells --- aerospace applications
[NASA-CR-155155] N77-33601
Solid polymer electrolyte [SPE] fuel cell technology program, phase 1/1A --- design and fabrication
[NASA-CR-151506] N77-33605
Solid polymer electrolyte [SPE] fuel cell technology program, phase 2/2A --- testing and evaluations
[NASA-CR-151507] N77-33606
Europe's changing energy relations
[R-2086-ISA] N77-33610
An approach for managing an energy conservation program
[AD-A041086] N77-33614
DoD energy R And D. Part 2: Military fuel operations. Performance and R and D implications
[AD-A042272] N77-33617
Sandia Laboratories energy programs
[SAND-77-0034] N77-33629
Design and cost study of a zinc/nickel oxide battery for electric vehicle propulsion
[ANL-K-76-3543-1] N77-33635
Analysis of the California energy industry
[LBL-5928] N77-33640
Accounting systems for energy conservation
[LA-6569-MS] N77-33646
Program plan for ERDA's participation in the IEA working party on energy conservation research and development
[ERDA-77-57] N77-33648
Solar radiation availability for New Mexico
[SAND-77-0004] N77-33654
Ecological considerations of the solar alternatives
[LBL-5927] N77-33655
Solar collector manufacturing activity
[PB-266985/1] N77-33664
Window design strategies to conserve energy
[PB-269297/8] N77-33669
Energy policy decisionmaking, organization, and national energy goals
[PB-269299/4] N77-33671
Public participation in energy related decision making, edited transcripts
[PB-268781/2] N77-33674
Energy interrelationships. A handbook of tables and conversions factors for combining and comparing international energy data
[PB-269034/5] N77-33675
Role of nuclear power in meeting future U.S. energy needs
[IAEA-CN-36/396] N77-33677
Energy options open to mankind beyond the turn of the century
[IAEA-CN-36/538] N77-33679
Survey of nuclear fuel cycle economics: 1970 - 1985
[ORNL-TM-5703] N77-33968

ENERGY REQUIREMENTS
World energy supply and demand and the future of nuclear power
[IAEA-CN-36/583] N77-33680
Nuclear power aspects in an oil and coal producing country
[IAEA-CN-36/175] N77-33681

ENERGY STORAGE
Design definition of a mechanical capacitor
[NASA-CR-152613] N77-33603
Redox bulk energy storage system study, volume 1
[NASA-CR-135206-VOL-1] N77-33608
Redox bulk energy storage system study, volume 2
[NASA-CR-135206-VOL-2] N77-33609
Preliminary feasibility evaluation of compressed air storage power systems, volume 1
[CONS/NSF/42-1] N77-33636

ENERGY TECHNOLOGY
Energy in an oasis: Geothermal resource development in the Imperial Valley of California
N77-33598
Advanced Thermal Energy Storage [TES] systems
[EPRI-EM-256-SY] N77-33622
Geophysical fluid dynamics background for ocean thermal power plants
[DSE/1005-1] N77-33624
Technical and economic feasibility of solar augmentation for boiler feedwater heating in steam-electric power plants
[COO-2864-1] N77-33626
Proceedings of the ERDA Semiannual Solar photovoltaic Program Review Meeting
[CONF-760837-P2] N77-33628

Sandia Laboratories energy programs
[SAND-77-0034] N77-33629
Energy technologies for the west: Possible effects of Energy Technology on Land, Water, and Air Resources
[TID-27444] N77-33632
Role of renewable energy technologies in developing countries
[BNL-22311] N77-33638
Energy and protein production from pulp mill wastes
[COO-2983-2] N77-33645
Interagency energy/environment research and development program: Status report 3
[PB-267443/0] N77-33662
Energy interrelationships. A handbook of tables and conversions factors for combining and comparing international energy data
[PB-269034/5] N77-33675
Energy options open to mankind beyond the turn of the century
[IAEA-CN-36/538] N77-33679

ENERGY TRANSFER
Reversible intermolecular energy transfer between chromium [3] complexes in fluid solution
[AD-A040661] N77-33966

ENGINE ANALYZERS
Preliminary results of USAF experience with engine monitoring and diagnostics
N77-33199

ENGINE CONTROL
Output feedback regulator design for jet engine control systems
[NASA-TM-73776] N77-33165
F100 multivariable control synthesis program: Evaluation of a multivariable control using a real-time engine simulation
[NASA-TP-1056] N77-33169
Methods of improving the performance reliability of advanced military power plant systems
N77-33198

ENGINE DESIGN
Power plant reliability
[AGARD-CP-215] N77-33181
CFM56 turbofan maintainability and reliability-oriented development
N77-33189
Aircraft engine design and development through lessons learned
N77-33190

ENGINE FAILURE
Civil airworthiness requirements for powerplant reliability
N77-33185
Development procedures to promote reliability
N77-33188
Testing simulation of damages occurred in service
N77-33194
Experimental investigation on the influence of component faults on turbojet engine performance
N77-33197

ENGINE MONITORING INSTRUMENTS
Maintenance methods for improving propulsion system reliability
N77-33184
The evolution and control of different performance degradation processes in modern propulsion systems -- monitoring jet engines
N77-33193
Methods of improving the performance reliability of advanced military power plant systems
N77-33198
Preliminary results of USAF experience with engine monitoring and diagnostics
N77-33199

ENGINE NOISE
State-of-the-art of turbofan engine noise control
[NASA-TM-73734] N77-33166
High velocity jet noise source location and reduction. Task 4: Development/evaluation of techniques for inflight investigation
[AD-A041849] N77-33175
Supersonic jet exhaust noise investigation. Volume 4: Acoustic far-field/near-field data report
[AD-A041819] N77-33177
Investigation of feasible nozzle configurations for noise reduction in turbofan and turbojet aircraft. Volume 3: Shrouded slot nozzle configurations
[AD-A041782] N77-33179

ENGINE TESTS
CFM56 turbofan maintainability and reliability-oriented development
N77-33189
Progress in determining service life by endurance tests -- Concorde aircraft
N77-33195
Accelerated mission test: A vital reliability tool
N77-33196
Experimental investigation on the influence of component faults on turbojet engine performance
N77-33197

ENTHALPY
Heat capacity and enthalpy of liquids. 3: Halogenated ethanes and ethylenes
[ESDU-77007] N77-33273
Estimation of net enthalpies of combustion of some aviation fuels expressed in the international system of units [SI]
[NBS-TN-937] N77-33370

ENTROPY
A theoretical approach to glass transition phenomena
N77-33289

ENVIRONMENT EFFECTS
Ecological considerations of the solar alternatives
[LBL-5927] N77-33655

ENVIRONMENT MANAGEMENT
Reflections of regional environmental systems
[ORNL-RUS-26] N77-33695

ENVIRONMENT POLLUTION
Significance of environmental research tasks at the German Aviation and Space Research Institute
[DLR-IB-553-75/5] N77-33697

ENVIRONMENT PROTECTION
Interagency energy/environment research and development program: Status report 3
[PB-267443/0] N77-33662

ENVIRONMENTAL MONITORING
Investigation of environmental change pattern in Japan. Classification of shorelines -- Nagoya, Yokkaichi, and Ria, Japan
[E77-10224] N77-33555
Investigation of environmental change pattern in Japan. Utilization of LANDSAT-2 data for fisheries
[E77-10227] N77-33558

ENVIRONMENTAL QUALITY
Appropriate technology: A directory of activities and projects
[PB-267970/2] N77-34052

ENVIRONMENTAL SURVEYS
Energy technologies for the west: Possible effects of Energy Technology on Land, Water, and Air Resources
[TID-27444] N77-33632
Compilation of documented computer codes applicable to environmental assessment of radioactivity releases
[ORNL-TM-5830] N77-33691
Practical use of decision theory to assess uncertainties about actions affecting the environment
[PB-269011/3] N77-33702

EQUATIONS OF STATE
A theoretical approach to glass transition phenomena
N77-33289
On the units of the equilibrium constant
[AD-A041953] N77-34028

EQUILIBRIUM EQUATIONS
Equilibrium of REB-ring with soft-core
[IPPJ-260] N77-33978
Helically symmetric equilibrium of current-carrying finite beta plasma
[IPPJ-270] N77-33987

EQUILIBRIUM FLOW
Theory of two-fluid equilibrium of an axially symmetric plasma
[IPPJ-282] N77-33997

EQUILIBRIUM METHODS
Theory of two-fluid equilibrium of an axially symmetric plasma
[IPPJ-282] N77-33997

EQUIPOTENTIALS
Electric field topology near the dayside magnetopause
[TRITA-EPP-77-12] N77-33737

EQUIVALENT CIRCUITS
Equivalent circuit representation of coupled multiwire line and its application
[MONO-24-1977] N77-33403
Modal decomposition and equivalent circuit representations of lossless coupled multiwire lines
N77-33404
Modal decomposition and equivalent circuit representations of lossy coupled multiwire lines
N77-33405
A new analysis of n-way hybrid power dividers with equiamplitudes
N77-33406

ERGOMETERS
Ergometer
N77-33826

ERROR ANALYSIS
Analysis of inherent errors in asynchronous digital flight controls
[AD-A041813] N77-33206
Satellite to satellite tracking error analysis studies and data processing
[NASA-CR-144832] N77-33237
Study of the relationships of three factors on errors in inspection
[Y-2075] N77-33531
Error behavior of multistep methods applied to unstable differential systems
[NASA-CR-155169] N77-33941
The art of cost-benefit analysis
[AD-A041756] N77-34045

ERROR CORRECTING CODES
Fault tolerant computing: A preamble for assuring viability of large computer systems
[NASA-TP-1067] N77-33868

ERROR DETECTION CODES
Fault tolerant computing: A preamble for assuring viability of large computer systems
[NASA-TP-1067] N77-33868

ERYTHROCYTES
Blood volume changes
N77-33806
Red cell metabolism studies on Skylab
N77-33807

ESCAPE SYSTEMS
Bibliography of research reports and publications: Impact, vibration, windblast and escape, 1942 - 1976
[AD-A042201] N77-33850

ETHANE
Heat capacity and enthalpy of liquids. 3: Halogenated ethanes and ethylenes
[ESDU-77007] N77-33273

ETHYL COMPOUNDS
Preliminary assessment of relative toxicity of ethyl centralite [N, N prime-diethylcarbanilide]
[AD-A041736] N77-33371

ETHYLENE
Heat capacity and enthalpy of liquids. 3: Halogenated ethanes and ethylenes
[ESDU-77007] N77-33273

EUROPE
Europe's changing energy relations
[R-2086-ISA] N77-33610

EVACUATING [VACUUM]
Reliability study of vapor recovery systems at service stations
[PB-267613/8] N77-33700

EVALUATION
Evaluation of design safety factors for time-dependent buckling
[SAND-76-0721] N77-33547
Biological conversion of biomass to methane
[COO-2917-76-2] N77-33627

EVAPOTRANSPIRATION
Application of remote sensing in South Dakota to provide accurate inventories of agricultural crops, enhance contrast in photographic products, monitor rangeland habitat loss, map Aspen, and prepare hydrogeologic surveys
[E77-10237] N77-33568

EXHAUST DIFFUSERS
Subsonic diffuser with injection flow
[RM-644] N77-33441

EXHAUST GASES
Pollution reduction technology program for small jet aircraft engines, phase 1
[NASA-CR-135214] N77-33168
Considerations on air pollution propagation from aircraft
[DLR-IB-553-75/6] N77-33698
Evaluation of the disposal of flue gas desulfurization wastes in mines and the ocean: Initial assessment
[PB-269270/5] N77-34058

EXOBIOLOGY
Space Biology and Aerospace Medicine, no. 4, 1977
[JPRS-69964] N77-33843

EXPERIMENTAL DESIGN
Studies of orbital Eoetvoes experiments
[NASA-CR-155193] N77-33226
Experimental design studies and flow visualization of proportional laminar-flow fluidic amplifiers
[NASA-TN-D-8433] N77-33442
A review of knowledge based problem solving as a basis for a genetics experiment designing system
[AD-A042720] N77-33946

EXPERIMENTATION
Skylab medical program overview
N77-33781
Flight control experiences
N77-33782

EXPLORER 12 SATELLITE
Data Processing for the S3 satellites
[AD-A041912] N77-33243

EXPLOSIONS
High speed foil breakers
[UCRL-TRANS-11226] N77-33428
Study of electric explosion of cylindrical foils in air
[UCRL-TRANS-11227] N77-33429
Direct initiation of detonation by non-ideal blast waves
[AD-A042811] N77-33454

EXTENSIONS
Theoretical parametric study of the relative advantages of winglets and wing-tip extensions
[NASA-TP-1020] N77-33112

EXTERNAL STORES
Active flutter suppression of an airplane with wing mounted external stores
N77-33211

EXTINGUISHING
Extinguishability as a component measure of flammability hazards
[PB-269489/1] N77-33310

EXTRAVEHICULAR ACTIVITY
Metabolic cost of extravehicular activities
N77-33818

EXTREMELY LOW RADIO FREQUENCIES
Experimental investigation of the characteristics of Pc1 micropulsation propagation using a midlatitude five-station receiving network
[AD-A040265] N77-33392

Air/undersea communication at ultra-low-frequencies using airborne loop antennas
[AD-A042132] N77-33395
EXTRUDING
Raman scattering studies of chain orientation in hydrostatically extruded polypropylene
[AD-A041096] N77-33356

F

F-8 AIRCRAFT
F-8C adaptive flight control laws
[NASA-CR-2880] N77-33202
F-8C adaptive flight control extensions — for maximum likelihood estimation
[NASA-CR-2881] N77-33203
F-14 AIRCRAFT
Human factors engineering considerations in designing Naval aircraft for maintainability
[AD-A041156] N77-33153
F-106 AIRCRAFT
High velocity jet noise source location and reduction. Task 4: Development/evaluation of techniques for inflight investigation
[AD-A041849] N77-33175
FABRICS
The measurement of fabric flammability parameters in movement simulation experiments
[PB-268902/4] N77-33309
Extinguishability as a component measure of flammability hazards
[PB-269489/1] N77-33310
Investigation of fabric weave construction versus tear resistance
[AD-A041259] N77-33359
FAILURE MODES
Testing simulation of damages occurred in service N77-33194
Experimental investigation on the influence of component faults on turbojet engine performance N77-33197
FAIRINGS
Design and fabrication of termination boots for mechanical/electromechanical cable terminations
[AD-A041857] N77-33526
FAR FIELDS
Measurement of far field combustion noise from a turbofan engine using coherence functions
[NASA-TM-73748] N77-33163
Supersonic jet exhaust noise investigation. Volume 4: Acoustic far-field/near-field data report
[AD-A041819] N77-33177
FAST FOURIER TRANSFORMATIONS
A study of the marine magnetic anomaly pattern employing techniques based on the Fast Fourier Transform Algorithm N77-33712
FATIGUE [MATERIALS]
Engine structural integrity program [ENSIP] N77-33182
FATIGUE LIFE
Ductility normalized-strainrange partitioning life relations for creep-fatigue life predictions
[NASA-TM-73737] N77-33536
FATIGUE TESTS
A-37B fatigue sensor evaluation program: Full scale test and field aircraft instrumentation
[AD-A042114] N77-33156
FEASIBILITY
Solar power satellite. Concept evaluation. Activities report. Volume 2: Detailed report
[NASA-TM-74942] N77-33600
Solar energy: Policy and prospects
[PB-267986/8] N77-33620
FEASIBILITY ANALYSIS
Feasibility analysis of gravitational experiments in space
[NASA-CR-155148] N77-33223
Feasibility and systems definition study for Microwave Multi-Application Payload [MMAP]
[NASA-CR-152611] N77-33251
Feasibility study of a 400 Hz, 4160 volt 3-phase electrical power distribution system
[AD-A042042] N77-33422
Feasibility study of thermocouple correlation type transit time flowmeter in transient steam-water flow
[TREE-NUREG-1011] N77-33489
Technical and economic feasibility of solar augmentation for boiler feedwater heating in steam-electric power plants
[COO-2864-1] N77-33626
Preliminary feasibility evaluation of compressed air storage power systems, volume I
[CONS/NSF/42-1] N77-33636
FEEDBACK
The application of the Kalman-Bucy filter theory to the design of feedback networks for Doppler supported inertial navigation systems in flight
[DLR-IB-552-75/18] N77-33141
FEEDBACK CONTROL
Output feedback regulator design for jet engine control systems
[NASA-TM-73776] N77-33165
Asymptotic properties of the discrete minimum variance output feedback control
[AD-A042782] N77-33903
FEET [ANATOMY]
Changes in the Achilles tendon reflexes following Skylab missions N77-33795
FERRITES
Interaction of a rectangular ferrite slab with magnetic fields
[AD-A041944] N77-33386
FIBER OPTICS
State of the art in fiber optics communications and data transfer
[AD-A042579] N77-33398
Optical fiber cutting machine for rectangular and circular fibers
[AD-A041506] N77-33521
The effects of fast and thermal neutron flux and gamma radiation on the transmission characteristics of optical fibers
[AD-A042429] N77-33975
FIBER STRENGTH
Investigation of fabric weave construction versus tear resistance
[AD-A041259] N77-33359
FIELD EMISSION
Electromagnetic plasma wave emissions from the auroral field lines
[NASA-CR-155172] N77-33387
FILAMENT WINDING
Recent advances in lightweight, filament-wound composite pressure vessel technology
[NASA-TM-73699] N77-33265
FILM THICKNESS
Analysis of film thickness effect in slow-speed lightly-loaded elastrohydrodynamic contacts. Part 3: Experimental measurement of lubricant film thickness
[AD-A041205] N77-33522
Optical properties of chemically sprayed CdS/Cu/sub x/S photovoltaic cells
[SAND-76-0729] N77-33656
FINITE DIFFERENCE THEORY
Finite-difference methods for plane steady inviscid transonic flows
[TRITA-GAD-2] N77-33109
Derivation of conservative finite difference expressions for the Navier-Stokes equations
[K/CSD-5] N77-33455
Numerical solutions of the Buckley-Leverett problem
[STF71-A75024] N77-33463
FINITE ELEMENT METHOD
A general three-dimensional computational model for nonlinear composite structures and materials
[AD-A041413] N77-33269
Reservoir flow: Two-phase incompressible flow — using finite element method
[STF71-A74038] N77-33461
Numerical solutions of the Buckley-Leverett problem
[STF71-A75024] N77-33463
A finite element model for the analysis of waterflood performance
[STF71-A75036] N77-33464
Immiscible flow by finite elements
[STF71-A76017] N77-33466
Elastic plate buckling using finite elements
[NCRE/R627] N77-33532
Nonlinear formulation of finite element by corotational coordinates
[ANL-CT-77-9] N77-33548
Research initiation: Mixed and hybrid finite element analysis of problems in structural mechanics
[PB-268300/1] N77-33550
Development of finite element models for the earth's gravity field. Phase 1: Macrogravity model for satellite orbit integration
[AD-A038463] N77-33728
Review of finite fields: Applications to discrete Fourier, transforms and Reed-Solomon coding
[NASA-CR-155167] N77-33875
FIRES
UNDSAFE-I: A computer code for buoyant flow in an enclosure
[PB-267278/0] N77-33476
Monitoring the extent and occurrence of fire in the different veld types of South Africa with particular reference to its ecological role and role in range management
[E77-10226] N77-33557
Human behavior in institutional fires and its design implications
[NBS-GCR-77-93] N77-33854
FISHES
Investigation of environmental change pattern in Japan. Utilization of LANDSAT-2 data for fisheries
[E77-10227] N77-33558
FIXED POINTS [MATHEMATICS]
Reforger 77 support. Part B: Test of a suggested approach to spreading climatology to grid points
[AD-A041879] N77-33752
FLAME PROBES
EPA laser flame analyzer system
[AD-A041216] N77-33501
FLAMMABILITY
The measurement of fabric flammability parameters in movement simulation experiments
[PB-268902/4] N77-33309
Extinguishability as a component measure of flammability hazards
[PB-269489/1] N77-33310
FLAPS [CONTROL SURFACES]
A flight investigation of the wake turbulence alleviation resulting from a flap configuration change on a B-747 aircraft
[NASA-TM-73263] N77-33130
FLASH
Visual light flash observations on Skylab 4 N77-33794
FLASH LAMPS
Evaluation of revised approach lighting criteria
[AD-A038442] N77-33218
FLAT PLATES
Applications of the extremal principles of elasticity to the determination of stress intensity factors
[AD-A042669] N77-33545
FLEXIBILITY
Direct determination of flexural strains in plates using projected gratings
[AD-A041917] N77-33537
FLEXIBLE BODIES
Comparative systems study of magnetically suspended flywheels — for stationary satellites with flexible appendages
[ESA-TT-393] N77-33245
FLIGHT CHARACTERISTICS
Handling qualities of the RH-53D in the design growth configuration
[SER-651317] N77-33144
FLIGHT CONTROL
Modeling and parameter uncertainties for aircraft flight control system design
[NASA-CR-2887] N77-33149
Digital flight control systems
[NASA-CR-145246] N77-33200
F-8C adaptive flight control laws
[NASA-CR-2880] N77-33202
F-8C adaptive flight control extensions — for maximum likelihood estimation
[NASA-CR-2881] N77-33203
Analysis of inherent errors in asynchronous digital flight controls
[AD-A041813] N77-33206
Structural Aspects of Active Controls
[AGARD-CP-228] N77-33208
A practical optimum selection procedure for a motivator in active flutter suppression system design on an aircraft with underwing stores N77-33209
YC-14 control system redundancy N77-33214
High angle of attack flight control using stochastic model reference adaptive control
[AD-A041436] N77-33897
FLIGHT INSTRUMENTS
A-37B fatigue sensor evaluation program: Full scale test and field aircraft instrumentation
[AD-A042114] N77-33156
FLIGHT SIMULATION
High velocity jet noise source location and reduction. Task 4: Development/evaluation of techniques for inflight investigation
[AD-A041849] N77-33175
Rotorcraft flight simulation with coupled rotor aeroelastic stability analysis. Volume 1: Engineer's manual
[AD-A042462] N77-33207
Researcher's guide to the NASA Ames Flight Simulator for Advanced Aircraft [FSAA]
[NASA-CR-2875] N77-33230
FLIGHT SIMULATORS
Investigation of diagnostic, error detector and self-taught instructional strategies for flight simulator programs
[AD-A035682] N77-33216
An assessment of the role of simulators in military flight training. Volume 1: Assessment based on survey interviews
[AD-A041222] N77-33217
Researcher's guide to the NASA Ames Flight Simulator for Advanced Aircraft [FSAA]
[NASA-CR-2875] N77-33230
Vestibular-visual interactions in flight simulators
[NASA-CR-155200] N77-33847
Methods for the electronic simulation of flight sounds
[NASA-TT-F-17432] N77-33956
FLIGHT STABILITY TESTS
Performance flight tests of the RH-53D design growth configuration
[SER-651316] N77-33143
FLIGHT TESTS
Flight evaluation of an advanced technology light twin-engine airplane [ATLIT]
[NASA-CR-2832] N77-33104
A flight investigation of the wake turbulence alleviation resulting from a flap configuration change on a B-747 aircraft
[NASA-TM-73263] N77-33130

Requirements for flight testing automated terminal service
[AD-A041975] N77-33137
An assessment of the hover performance of the XH-59A advancing blade concept demonstration helicopter
[AD-A042063] N77-33155

FLIGHT TRAINING
Investigation of diagnostic, error detector and self-taught instructional strategies for flight simulator programs
[AD-A035682] N77-33216
An assessment of the role of simulators in military flight training. Volume 1: Assessment based on survey interviews
[AD-A041222] N77-33217

FLOOD PREDICTIONS
Applied Remote Sensing Program [ARSP] — Apache, Yavapai, Graham, and Yuma countries, Arizona
[E77-10240] N77-33571

FLOODS
A finite element model for the analysis of water-flood performance
[STF71-A75036] N77-33464
WFLOOD: Users's description. A simulation model for oil reservoirs subjected to waterflooding — based on finite element method
[STF71-A76005] N77-33465
Operations of the National Weather Service
[PB-268041/1] N77-33754
A comparison of the frequency distribution of four-hour totals of manually digitized radar data with flooding over a portion of the Southeastern United States
[PB-268872/9] N77-33760

FLORIDA
LANDSAT planning applications in east central Florida
[E77-10238] N77-33569

FLOW CHARACTERISTICS
The numerical calculation of steady inviscid supercritical flow past ellipsoids without circulation
[AD-A041016] N77-33453

FLOW CHARTS
US energy flow in 1976
[UCID-17443] N77-33639

FLOW DISTORTION
Study of noise and inflow distortion sources in the NASA QF-1B fan using measured blade and vane pressures
[NASA-CR-2899] N77-33113

FLOW DISTRIBUTION
Flow-field surveys on the windward side of the NASA 040A space shuttle orbiter at 31 deg angle of attack and Mach 20 in helium
[NASA-TM-X-3560] N77-33236
Two-dimensional numerical model of the nearfield flow for an ocean thermal power plant. Part 3: Manual for the computer code NRFL02
[DSE/1005-7] N77-33623

FLOW GEOMETRY
Three dimensional steady and unsteady asymmetric flow past wings of arbitrary planforms
[NASA-CR-145235] N77-33102

FLOW MEASUREMENT
EPA laser flame an alyzer system
[AD-A041216] N77-33501

FLOW STABILITY
On the stability of two basic parallel flows: Analysis, progress report and proposal for further research
[AD-A041946] N77-33450

FLOW VELOCITY
Correlation analysis of flow velocity fluctuations in a subsonic free jet
[ISL-R-134/76] N77-33469

FLOW VISUALIZATION
Experimental design studies and flow visualization of proportional laminar-flow fluidic amplifiers
[NASA-TN-D-8433] N77-33442
Coherent structure of a turbulent boundary layer in a convected reference frame
[AD-A041751] N77-33448

FLOWMETERS
Feasibility study of thermocouple correlation type transit time flowmeter in transient steam-water flow
[TREE-NUREG-1011] N77-33489

FLUID AMPLIFIERS
Experimental design studies and flow visualization of proportional laminar-flow fluidic amplifiers
[NASA-TN-D-8433] N77-33442

FLUID DYNAMICS
UNDSAFE-I: A computer code for buoyant flow in an enclosure
[PB-267278/0] N77-33476
Physical vulnerability of aircraft due to fluid dynamic effects
[AGARD-AR-106] N77-33478
Geophysical fluid dynamics background for ocean thermal power plants
[DSE/1005-1] N77-33624

FLUID FLOW
On the stability of two basic parallel flows: Analysis, progress report and proposal for further research
[AD-A041946] N77-33450
Research initiation: Mixed and hybrid finite element analysis of problems in structural mechanics
[PB-268300/1] N77-33550
Anthropometric changes and fluid shifts
N77-33812

FLUID MECHANICS
From Soup to Nuts: The 7th International Congress on Rheology
[AD-A041227] N77-33445

FLUORESCENCE
Study of selected diatomic metal oxides and halides using chemiluminescence and laser-induced flourescence
N77-33291

FLUORINE COMPOUNDS
Low temperature fluorine chemistry of electronegative elements
[AD-A041439] N77-33298

FLUTTER
A practical optimum selection procedure for a motivator in active flutter suppression system design on an aircraft with underwing stores
N77-33209
Active flutter suppression of an airplane with wing mounted external stores
N77-33211
Wind tunnel study of an active flutter suppression system
N77-33215

FLY BY WIRE CONTROL
F-8C adaptive flight control laws
[NASA-CR-2880] N77-33202

FLYWHEELS
Comparative systems study of magnetically suspended flywheels — for stationary satellites with flexible appendages
[ESA-TT-393] N77-33245
Design definition of a mechanical capacitor
[NASA-CR-152613] N77-33603

FOG
Statistical diagnostic modeling of marine fog using model output parameters
[AD-A042059] N77-33748
A simulated mission success indicator for use with probability forecasts at Travis AFB, California
[AD-A041880] N77-33751

FOLDING STRUCTURES
Investigation of coating compounds and adhesives for self-supporting collapsible fuel storage tanks
[AD-A042653] N77-33369

FORECASTING
Role of nuclear power in meeting future U.S. energy needs
[IAEA-CN-36/396] N77-33677
Energy options open to mankind beyond the turn of the century
[IAEA-CN-36/538] N77-33679
World energy supply and demand and the future of nuclear power
[IAEA-CN-36/583] N77-33680
Survey of nuclear fuel cycle economics: 1970 - 1985
[ORNL-TM-5703] N77-33968
The stochastic formulation of a modified cobweb model
[AD-A042737] N77-34046

FORESTS
Applications of remote sensing — Texas, South Dakota, North Dakota, and Kansas
[E77-10103] N77-33553
Application of remote sensing technology to the solution of problems in the management of resources in Indiana
[E77-10223] N77-33554
Seismotectonic, structural, volcanologic, and geomorphic study of New Zealand; indigenous forest assessment in New Zealand; mapping, land use, and environmental studies in New Zealand, volume 1
[E77-10233] N77-33564
Seismotectonic, structural, volcanologic, and geomorphic study of New Zealand; indigenous forest assessment in New Zealand; mapping, land use and environmental studies in New Zealand, volume 3
[E77-10235] N77-33566
Investigation of environmental change pattern in Japan. Investigation of the ecological environment index from observation of the regional vegetation cover and their growing condition
[E77-10244] N77-33575

FORMULAS [MATHEMATICS]
Revised and enlarged collection of plasma physics formulas and data
[AD-A041545] N77-34006

FORTRAN
UXDD80 graphic system
[UCID-30146] N77-33873

FOSSIL FUELS
Experimental program for the development of peat gasification
[FE-2469-3] N77-33650

FOURIER SERIES
PFLASH: A program to calculate Fourier cosine coefficients for pressure distributions
[SAND-76-0280] N77-33456

FOURIER TRANSFORMATION
Review of finite fields: Applications to discrete Fourier, transforms and Reed-Solomon coding
[NASA-CR-155167] N77-33875

FRACTURE MECHANICS
A study of constituent, dispersoid, and hardening particles in the fracture of 7075 aluminum alloys
[AD-A041421] N77-33319
A treatment of the subject of tearing instability
[PB-270277/7] N77-33335

FRACTURES [MATERIALS]
Theory of ultrasonic diffraction by damage developed in thin laminated composites
[NASA-CR-155161] N77-33266

FREE FLOW
Ratio between dynamical and thermal dissipation in turbulent flows
[AAAF-NT-77-21] N77-33472
Effect of free stream turbulence on turbulent boundary layers in incompressible flow
[ESA-TT-411] N77-33475

FREE JETS
Study of liquid jet impingement on screens
[NASA-CR-135260] N77-33437
Correlation analysis of flow velocity fluctuations in a subsonic free jet
[ISL-R-134/76] N77-33469

FREQUENCY MEASUREMENT
Time and frequency user's manual
[PB-269220/0] N77-33952

FREQUENCY SHIFT
Computer simulations on the nonlinear frequency shift and nonlinear modulation of ion-acoustic waves
[IPPJ-266] N77-33983

FREQUENCY STANDARDS
Tactical miniature crystal oscillator
[AD-A041411] N77-33436
Time and frequency user's manual
[PB-269220/0] N77-33952

FRESNEL INTEGRALS
An improved formulation for extending the geometrical theory of diffraction by the moment method
[AD-A041775] N77-33972

FRICTION
Measurement of solid friction parameters of ball bearings
[AD-A042599] N77-33528

FRICTION FACTOR
X-Ray photoelectron spectroscopy study of radiofrequency-sputtered titanium, carbide, molybdenum carbide, and titanium boride coatings and their friction properties
[NASA-TP-1033] N77-33348

FUEL CELLS
Solid polymer electrolyte [SPE] fuel cell technology program, phase 1/1A — design and fabrication
[NASA-CR-151506] N77-33605
Solid polymer electrolyte [SPE] fuel cell technology program, phase 2/2A — testing and evaluations
[NASA-CR-151507] N77-33606
Application of the Alsthom/Exxon alkaline fuel cell system to utility power generation
[EPRI-EM-384] N77-33643

FUEL COMBUSTION
Estimation of net enthalpies of combustion of some aviation fuels expressed in the international system of units [SI]
[NBS-TN-937] N77-33370

FUEL CONSUMPTION
The President's energy program
[GPO-88-556] N77-33599
Energy statistics: A supplement to the summary of national transportation statistics
[PB-269301/8] N77-33672

FUEL TANKS
Investigation of coating compounds and adhesives for self-supporting collapsible fuel storage tanks
[AD-A042653] N77-33369

FUELS
Alternate petroleum based fuels for naval fleet usage: potential availability, cost, and system impact
[AD-A041980] N77-33372
DoD energy R And D. Part 2: Military fuel operations. Performance and R and D implications
[AD-A042272] N77-33617

FUNCTION SPACE
Results in semi-inner-product spaces and generalized cosine operator functions
N77-33949
Finiteness of simplicial function spaces
N77-33951

FUNCTIONAL ANALYSIS
Regular multivalued functions and algorithmic applications
N77-33904

FURNACES
Transparent materials processing system
[NASA-CR-150411] N77-33516

FUSELAGES
Notes on the pollution of airplanes and helicopters by chemicals during agricultural jobs
[NASA-TT-F-17444] N77-33129

FUSION REACTORS
Second workshop on conceptual design studies of Experimental Power Reactor-1
[ERDA-77-36] N77-34009
FUSION-FISSION HYBRID REACTORS
Fusion-fission hybrid reactors: A capsule introduction
[UCID-17397] N77-34011
Fusion systems engineering
[BNWL-1939-6] N77-34013

G

GALAXIES
The X-ray emitting galaxy Cen-A
[NASA-TM-X-71402] N77-34092
GALILEAN SATELLITES
Report of the Terrestrial Bodies Science Working Group. Volume 1: Executive summary — Terrestrial planets, Galilean satellites, Comets, Asteroids, and the Moon
[NASA-CR-155189] N77-34074
Report of the Terrestrial Bodies Science Working Group. Volume 7: The Galilean satellites
[NASA-CR-155183] N77-34080
GALLIUM ARSENIDES
Investigation of GaAs solar cell potential performance and cost
[AD-A040736] N77-33612
GAMMA RAY ABSORPTIOMETRY
Bone mineral measurement: Experiment M078
N77-33800
GARP ATLANTIC TROPICAL EXPERIMENT
Raindrop size distributions and Z-R relationships measured on the NOAA DC-6 and the ship Researcher within the GATE B-scale array
[PB-269659/9] N77-33769
US national processing center for GATE: B-scale precipitation data
[PB-270222/3] N77-33770
GAS BEARINGS
Fundamentals of gas lubrication
[AD-A041163] N77-33523
GAS CHROMATOGRAPHY
Analysis of gases in metals: The dc arc gas chromatographic technique. Part 4: Simultaneous determination of H2, O2, and N2 in metals using argon as inert gas medium
[BARC-800-PT-4] N77-33307
GAS DETECTORS
Evaluation of continuous monitors for carbon monoxide in stationary sources
[PB-268861/2] N77-33708
GAS DISCHARGES
Forty kilovolt megawatt average power thyratron [maps 40]
[AD-A042082] N77-33420
GAS FLOW
GASSIM. User's description: A gas reservoir simulation model
[STF71-A76020] N77-33467
GAS INJECTION
Fundamental aerodynamic study of local injection in a turbulent boundary layer
[ESA-TT-412] N77-33127
Subsonic diffuser with injection flow
[RM-644] N77-33441
GAS IONIZATION
Gas phase X-ray photoelectron spectroscopy of compounds containing multiply-bonded oxygen
N77-33278
GAS RECOVERY
Systems studies of energy conservation: Methane produced from coalbeds, volume 2
[MERC/CR-77/4-VOL-2] N77-33661
GAS TURBINE ENGINES
The current state of research and design in high pressure ratio centrifugal compressors — for gas turbine engines
[AD-A041011] N77-33172
Development procedures to promote reliability
N77-33188
A procedure for predicting the life of turbine engine components
N77-33192
Lean premixed/prevaporized combustion
[NASA-CP-2016] N77-33297
GAS TURBINES
Investigation of local damage and impulse delivered to turbine blades by normal and oblique projectile impacts
[AD-A041780] N77-33178
Pressureless sintering of SiAlon gas turbine components
[AD-A041207] N77-33353
Design and development of a major engine component [compressor] for a 60 kW turbine generator set
[AD-A041717] N77-33525
GAS-SOLID INTERFACES
Theoretical and experimental investigations on shock waves in gas-solid flows
[ILR-18] N77-33468
GASES
Interaction of pulsed CO2 and pulsed HF/DF laser radiation with gaseous and solid targets
[AD-A041486] N77-33500
GASOLINE
Physical properties of gasoline/methanol mixtures
[BERC/RI-76/12] N77-33375
Overview and review of motor gasoline desulfurization, volume 1
[BERC/RI-76/17-VOL-1] N77-33377
Motor gasoline desulfurization study, volume 2
[BERC/RI-76/17-VOL-2] N77-33378
Reliability study of vapor recovery systems at service stations
[PB-267613/8] N77-33700
GAUSS EQUATION
Gaussian elimination and numerical instability
[AD-A042159] N77-33919
GENERAL AVIATION AIRCRAFT
Analysis of air accidents involving airplanes or helicopters of various types of application
[NASA-TT-F-17443] N77-33128
A research program to reduce interior noise in general aviation airplanes. Design of an acoustic panel test facility
[NASA-CR-155152] N77-33557
A research to reduce interior noise in general aviation airplanes. General aviation interior noise study
[NASA-CR-155153] N77-33958
A research program to reduce interior noise in general aviation airplanes — test methods and results
[NASA-CR-155154] N77-33959
GEOCHEMISTRY
Preliminary studies of the alteration of a granite by an artificial hydrothermal system
[LA-6696-MS] N77-33735
GEODESY
Gravity modeling for precise terrestrial inertial navigation
[AD-A042419] N77-33139
GEODETIC SURVEYS
Precision surveying using very long baseline interferometry
[NASA-TM-X-71405] N77-33588
GEOLOGICAL FAULTS
Structural lineament and pattern analysis of Missouri, using LANDSAT imagery
[E77-10239] N77-33570
GEOLOGICAL SURVEYS
Martian polar geological studies
[NASA-CR-155160] N77-34069
Geologic investigation of Mercury data and the subsequent mapping and explanation of the quadrangle area H-12
[NASA-CR-155159] N77-34070
GEOLOGY
Application of remote sensing technology to the solution of problems in the management of resources in Indiana
[E77-10223] N77-33554
Geology orbiter comparison study
[NASA-CR-155056] N77-34073
GEOMAGNETISM
The paleomagnetism of the Palisade Sill and the development of the arm correction method of paleointensity determination — anhysteretic remanence
N77-33711
The shapes of marine magnetic anomalies: Paleomagnetic field behavior, paleomagnetic poles and ridge crest processes
N77-33716
Neutral atmospheric waves in the thermosphere and tropospheric weather systems
[AD-A041239] N77-33723
GEOMORPHOLOGY
Seismotectonic, structural, volcanologic, and geomorphic study of New Zealand; indigenous forest assessment in New Zealand; mapping, land use, and environmental studies in New Zealand, volume 1
[E77-10233] N77-33564
Applied Remote Sensing Program [ARSP] — Apache, Yavapai, Graham, and Yuma countries, Arizona
[E77-10240] N77-33571
GEOPHYSICS
Geophysical fluid dynamics background for ocean thermal power plants
[DSE/1005-1] N77-33624
GEOPOTENTIAL
Development of finite element models for the earth's gravity field. Phase 1: Macrogravity model for satellite orbit integration
[AD-A038463] N77-33728
GEORGIA
Search for North American microtektites in Georgia coastal plain sediments
[NASA-CR-152596] N77-33719
GEOS 3 SATELLITE
Calibration results for the GEOS-3 altimeter
[NASA-CR-141430] N77-33261
Investigation of the applications of GEOS-3 radar altimeter data in remote sensing of land and sea features
[NASA-CR-141428] N77-33577
GEOTHERMAL ENERGY CONVERSION
Planning and design of additional East Mesa Geothermal Test Facilities. Phase 1B, Volume 2: Procurement package
[SAN/1140-1/2-VOL-2] N77-33657
GEOTHERMAL RESOURCES
Energy in an oasis: Geothermal resource development in the Imperial Valley of California
N77-33598
GERMANY
Significance of environmental research tasks at the German Aviation and Space Research Institute
[DLR-IB-553-75/5] N77-33697
GIMBALS
Conversion of computer software for the gimballed electrostatic gyro navigation system, volume 1
[AD-A041711] N77-33138
GLASS
A theoretical approach to glass transition phenomena
N77-33289
GLASS FIBERS
Optical fiber cutting machine for rectangular and circular fibers
[AD-A041506] N77-33521
GLIDERS
Development and construction of the small data acquisition system MINIDIG — for use on motor gliders ASK 16
[DLR-IB-553-76/6] N77-33492
GLOBAL AIR POLLUTION
Changes in the composition of the atmosphere and their impact upon climatic variability: An overview
[BMA-24] N77-33761
GOGGLES
Abrasion resistance of safety lenses. Effects of abrasion on toughened safety glass and plastic lenses with respect to their optical properties
[PB-267399/4] N77-33367
GOVERNMENT PROCUREMENT
Major system acquisition: Is a separate spares contract better
[AD-A042775] N77-34033
Impact of competitive procurement on configuration control
[AD-A042876] N77-34034
Life cycle costing: Case studies
[PB-268162/5] N77-34047
GOVERNMENT/INDUSTRY RELATIONS
Evaluation methodology for federal motor vehicle safety standards. Volume 1: Executive summary
[PB-266936/4] N77-33381
GOVERNMENTS
Inspection of Federal facilities for compliance with noise abatement standards
[PB-269298/6] N77-33704
GRAMMARS
Writing structured programs in dialog mode
[PU1R4/74] N77-33887
GRAND TOURS
Upgrading and testing program for narrow band high resolution planetary IR imaging spectrometer
[NASA-CR-155149] N77-33969
GRANITE
Preliminary studies of the alteration of a granite by an artificial hydrothermal system
[LA-6696-MS] N77-33735
GRAPHITE
Response of graphite composites to laser radiation
[AD-A041283] N77-33267
Development of intercalated graphite materials
[AD-A041214] N77-33270
GRAPHITE-EPOXY COMPOSITE MATERIALS
Theory of ultrasonic diffraction by damage developed in thin laminated composites
[NASA-CR-155161] N77-33266
Biaxial testing of graphite/epoxy composites containing stress concentrations, part 1
[AD-A041490] N77-33268
GRASSLANDS
Monitoring the extent and occurrence of fire in the different veld types of South Africa with particular reference to its ecological role and role in range management
[E77-10226] N77-33557
GRATINGS [SPECTRA]
A study of beam couplers for integrated optics
[AD-A042070] N77-33970
GRAVITATION
A study of the intermediate and long wavelength gravity field of the worlds oceans
N77-33777
Higher plant metabolism and energetics in hypogravity: Amino acid metabolism in higher plants
[NASA-CR-155198] N77-33840
GRAVITATION THEORY
Studies of orbital Eoetvoes experiments
[NASA-CR-155193] N77-33226
Dynamics of continua and particles from general covariance of Newtonian gravitation theory
[CNRS-CPT-76-P-849] N77-34029
GRAVITATIONAL CONSTANT
Feasibility analysis of gravitational experiments in space
[NASA-CR-155148] N77-33223

GRAVITATIONAL EFFECTS
Experiment M131. Human vestibular function N77-33791
The effects of prolonged exposure to weightlessness on postural equilibrium N77-33792
Study of metabolism and energetics in hypogravity: Degenerative effects of prolonged hypogravity [NASA-CR-155199] N77-33839

GRAVITATIONAL FIELDS
Gravity modeling for precise terrestrial inertial navigation [AD-A042419] N77-33139
Development of finite element models for the earth's gravity field. Phase 1: Macrogravity model for satellite orbit integration [AD-A038463] N77-33728

GRAVITY WAVES
Neutral atmospheric waves in the thermosphere and tropospheric weather systems [AD-A041239] N77-33723

GREAT PLAINS CORRIDOR [NORTH AMERICA]
Spectral measurement of watershed coefficients in the southern Great Plains — Texas, Arizona, and New Mexico [E77-10225] N77-33556

GREEN FUNCTION
An addition formula for Green's functions [AD-A041667] N77-33913
Green's function calculation of a metal-metal interface [AD-A041918] N77-34019

GROUND EFFECT MACHINES
Stability and control of ground effect aircraft in longitudinal motion [AD-A042005] N77-33205

GROUND SPEED
Behavior of aircraft antiskid breaking systems on dry and wet runway surfaces: A slip-ratio-controlled system with ground speed reference from unbraked nose wheel [NASA-TN-D-8455] N77-33150

GROUND STATIONS
Earth station design at 12/14 GHz [NASA-CR-152597] N77-33234

GROUND SUPPORT SYSTEMS
Tracking and data system support for the Viking 1975 mission to Mars. Volume 3: Planetary operations [NASA-CR-155168] N77-33229

GROUND TRUTH
Application of LANDSAT imagery in land use inventory and classification in Nebraska — Lower and Upper Niobrara area and Sheridan County [E77-10242] N77-33573
An analysis on vegetation cover by using LANDSAT MSS data [E77-10245] N77-33576

GROUND WATER
Procedures manual for ground water monitoring at solid waste disposal facilities [EPA-530/SW-611] N77-34051

GROUP THEORY
Arithmetical semigroup rings N77-33948

GROWTH
Fatigue crack growth at elevated temperature 316 stainless steel and H-13 steel [NASA-CR-135105] N77-33314

GUNN DIODES
Indium phosphide Gunn devices, 26-40 GHz [AD-A041329] N77-33418

GUNS [ORDNANCE]
A safety, quality and cost effectiveness study of composition A3 press loading parameters,2 [AD-A041078] N77-33383
Heat transfer analysis for unsteady high velocity pipe flow — gun barrels [AD-A041547] N77-33477

GUST LOADS
Impact of a command and stability augmentation system on gust response of a combat aircraft N77-33210

GYROSCOPES
Conversion of computer software for the gimballed electrostatic gyro navigation system, volume I [AD-A041711] N77-33138
Assessment of a dynamical gyroscope model utilizing digital simulation techniques [AD-A042497] N77-33488

H

H-53 HELICOPTER
Performance flight tests of the RH-53D design growth configuration [SER-651316] N77-33143
Handling qualities of the RH-53D in the design growth configuration [SER-651317] N77-33144

HAFNIUM ALLOYS
Theoretical investigation of anomalous properties of BCC, Ti, Zr, and Hf alloys [AD-A042108] N77-33323

HALIDES
Study of selected diatomic metal oxides and halides using chemiluminescence and laser-induced flourescence N77-33291

HALOGEN COMPOUNDS
Heat capacity and enthalpy of liquids. 3: Halogenated ethanes and ethylenes [ESDU-77007] N77-33273
Low temperature fluorine chemistry of electronegative elements [AD-A041439] N77-33298

HANDBOOKS
Researcher's guide to the NASA Ames Flight Simulator for Advanced Aircraft [FSAA] [NASA-CR-2875] N77-33230
Rocket radiation handbook. Volume 1: Rocket radiation phenomenology and theory [AD-A042640] N77-33263
An interface unit to link a real-time analyzer with an incremental recorder [field operation and service manual] [AD-A042130] N77-33487
Building energy handbook. Volume 1: Methodology for energy survey and appraisal [ERDA-76-163/1-VOL-1] N77-33658
Building energy handbook. Volume 2: Forms for energy survey and appraisal [ERDA-76-163/2-VOL-2] N77-33659
Energy interrelationships. A handbook of tables and conversions factors for combining and comparing international energy data [PB-269034/5] N77-33675
Revised and enlarged collection of plasma physics formulas and data [AD-A041545] N77-34006

HARDENING [MATERIALS]
Development of low-cost hardened zinc selenide for IR windows [AD-A042147] N77-33974

HAZARDS
Sealed primary lithium-inorganic electrolyte cell [AD-A036172] N77-33611
Some test results on the visibility of obstacle and hazard beacons [DLR-IB-553-76/5] N77-33862

HEALTH PHYSICS
Biological effects of electromagnetic waves. Selected papers of the USNC/URSI Annual Meeting, volume 2 [PB-268095/7] N77-33853

HEART
Determination of cardiac size from chest roentgenograms following Skylab missions N77-33819

HEART FUNCTION
Effect of prolonged space flight on cardiac function and dimensions N77-33815
Lower body negative pressure device N77-33821

HEAT PIPES
Thermal energy storage demonstration unit for Vuilleumier cryogenic cooler [AD-A040895] N77-33613

HEAT RESISTANT ALLOYS
Burner rig alkali salt corrosion of several high temperature alloys [NASA-TM-X-73659] N77-33313
The 100,000-hour cyclic oxidation behavior at 815C [1500 F] of 33 high-temperature alloys [NASA-TM-73707] N77-33316

HEAT STORAGE
Transpiration heat transfer in thermal energy storage devices [PB-267281/4] N77-33616
Advanced Thermal Energy Storage [TES] systems [EPRI-EM-256-SY] N77-33622
Consumer thermal energy storage costs for residential hot water, space heating and space cooling systems [ANL-K-76-3364-1] N77-33631
Strategies for commercializing customer thermal-energy storage [ANL-ES-55] N77-33649

HEAT TRANSFER
Heat transfer analysis for unsteady high velocity pipe flow — gun barrels [AD-A041547] N77-33477
Transpiration heat transfer in thermal energy storage devices [PB-267281/4] N77-33616
Nonlinear heat and particle transport due to collisional drift waves [IPPJ-281] N77-33996

HEATING
Early use of solar energy in buildings. A study of barriers and incentives to the widespread use of solar heating and cooling systems [PB-267832/4] N77-33618
Solar energy: Policy and prospects [PB-267986/8] N77-33620
Strategies for commercializing customer thermal-energy storage [ANL-ES-55] N77-33649

HEATING EQUIPMENT
Consumer thermal energy storage costs for residential hot water, space heating and space cooling systems [ANL-K-76-3364-1] N77-33631

HELICAL FLOW
Helically symmetric equilibrium of current-carrying finite beta plasma [IPPJ-270] N77-33987

HELICAL INDUCERS
Experimental and theoretical investigation of three-dimensional turbulent boundary layers and turbulence characteristics inside an axial flow inducer passage [NASA-CR-2888] N77-33106

HELICAL WINDINGS
Investigation of an aluminum rolling helix crash energy absorber [AD-A042084] N77-33132

HELICOPTER PERFORMANCE
Performance flight tests of the RH-53D design growth configuration [SER-651316] N77-33143
Handling qualities of the RH-53D in the design growth configuration [SER-651317] N77-33144
An assessment of the hover performance of the XH-59A advancing blade concept demonstration helicopter [AD-A042063] N77-33155

HELICOPTERS
Investigation of inside light reflection problem on the Flat Plate Canopy [FPC] for model 209 AH-IS helicopter [AD-A041332] N77-33858
The maximum detection range and the maximum recognition distance when observing ground targets from helicopters [DLR-IB-553-76/3] N77-33861

HELIOS A
Medium energy charged particle spectrometer. Experiment E8 Helios [ESA-TT-390] N77-34089

HELIOS B
Medium energy charged particle spectrometer. Experiment E8 Helios [ESA-TT-390] N77-34089

HELIUM
Flow-field surveys on the windward side of the NASA 040A space shuttle orbiter at 31 deg angle of attack and Mach 20 in helium [NASA-TM-X-3560] N77-33236
Power transmission project [BNL-22202] N77-33426
Investigations on approximate quantum mechanical wave functions for first period atoms and molecules N77-33964

HEMATOLOGY
Hematology and immunology studies N77-33808

HEMODYNAMIC RESPONSES
Hemodynamic studies of the legs under weightlessness N77-33811

HEOS B SATELLITE
Electric field topology near the dayside magnetopause [TRITA-EPP-77-12] N77-33737
Criticism of reconnection models of the magnetopause [TRITA-EPP-77-13] N77-33738

HETEROGENEITY
Heterogeneous acid catalysis by polymer colloids N77-33339

HEURISTIC METHODS
A review of knowledge based problem solving as a basis for a genetics experiment designing system [AD-A042720] N77-33946

HF LASERS
Interaction of pulsed CO2 and pulsed HF/DF laser radiation with gaseous and solid targets [AD-A041486] N77-33500
A CW HF laser with supersonic premixing and stationary shock initiation [AD-A041779] N77-33502
A hydrogen fluoride/deuterium flouride laser at the Naval Postgraduate School [AD-A042341] N77-33505

HIGH ENERGY INTERACTIONS
Solid state optics [AD-A041822] N77-34024

HIGH PRESSURE
The current state of research and design in high pressure ratio centrifugal compressors — for gas turbine engines [AD-A041011] N77-33172
Evaluation of analytical methodology for hydrocarbons in high pressure air and nitrogen systems — evaluation of methodology [NASA-CR-150409] N77-33379
Evaluation of analytical methodology for hydrocarbons in high pressure air and nitrogen systems — data aquisition [NASA-CR-150410] N77-33380

HIGH RESOLUTION
Upgrading and testing program for narrow band high resolution planetary IR imaging spectrometer
[NASA-CR-155149] N77-33969
HIGH SPEED
Heat transfer analysis for unsteady high velocity pipe flow — gun barrels
[AD-A041547] N77-33477
HIGH SPEED CAMERAS
Photographic study of rapid events by picosecond techniques
[ISL-CO-214/76] N77-33495
HIGH TEMPERATURE
Progress in advanced high temperature turbine materials, coatings, and technology
[NASA-TM-X-73628] N77-33159
Fatigue crack growth at elevated temperature 316 stainless steel and H-13 steel
[NASA-CR-135105] N77-33314
Role of stress effects in the oxidation behavior of high temperature alloys
[CONF-761057-4] N77-33333
HIGH TEMPERATURE ENVIRONMENTS
Development of a high temperature capacitive pressure transducer
[NASA-CR-135282] N77-33483
HIGH VOLTAGES
Manufacturing methods and techniques for miniature high voltage hybrid multiplier modules
[AD-A041765] N77-33423
HILBERT SPACE
Improved convergence for linear systems using three-part splittings
[AD-A041729] N77-33914
HOLLOW CATHODES
A hollow cathode hydrogen ion source
[NASA-TM-73783] N77-33999
HOLOGRAPHY
The theory of diffraction from a holographic lens
[AD-A041537] N77-33486
Reconstruction of a source from a few [2 or 3] projections
[LA-6747-MS] N77-33976
HOVERING
An assessment of the hover performance of the XH-59A advancing blade concept demonstration helicopter
[AD-A042063] N77-33155
HUMAN BEHAVIOR
Human behavior in institutional fires and its design implications
[NBS-GCR-77-93] N77-33854
HUMAN FACTORS ENGINEERING
Human factors engineering considerations in designing Naval aircraft for maintainability
[AD-A041156] N77-33153
Evaluation methodology for federal motor vehicle safety standards. Volume 1: Executive summary
[PB-266936/4] N77-33381
Evaluation methodology for federal motor vehicle safety standards. Volume 2: Technical findings
[PB-266937/2] N77-33382
Psychometric characteristics of astronauts
[AD-A039228] N77-33855
Improved seat, console, and workplace design: Annotated bibliography, integration of the literature, accommodation model, and seated operator reach profiles
[AD-A040479] N77-33857
A spatial frequency analysis model for predicting human performance at visual pattern matching tasks
[AD-A041649] N77-33859
Development of a continuous performance measure for manual control
[AD-A041676] N77-33900
HUMAN PERFORMANCE
Task and work performance on Skylab missions 2, 3, and 4: Time and motion study: Experiment M151
N77-33796
Neurophysiological estimates of human performance capabilities in aerospace systems
[AD-A038208] N77-33849
HUMAN REACTIONS
PROMETHEUS 2: A user oriented program for human crash dynamics
[PB-269305/9] N77-33866
Recovery of middle components of human auditory averaged electroencephalic response
N77-33953
HUMAN RESOURCES
An application of Markovian chains in manpower planning
[AD-A042304] N77-34032
HUMAN TOLERANCES
Lower body negative pressure: Third manned Skylab mission
N77-33809
Frequency dependence of impulse noise attenuation — hazard to hearing
[AD-A042031] N77-33961
HYDRAZINES
Density, compressibility, thermal conductivity, and mechanical movement of solid hydrazine
[AD-A042039] N77-33301
Development of air-monitoring techniques using solid sorbents. LASL Project R-059, NIOSH-1A-77-12
[LA-6738-PR] N77-33693
HYDROCARBONS
Sulfur poisoning of hydrocarbon oxidation by palladium
[NASA-CR-155192] N77-33264
Studies of crystal field, temperature, and concentration effects on the lowest triplet states of aromatic molecules in mixed single crystals
N77-33292
Computer program for determining the thermodynamic properties of light hydrocarbons
[UTEC-ME-76-211] N77-33376
Evaluation of analytical methodology for hydrocarbons in high pressure air and nitrogen systems — evaluation of methodology
[NASA-CR-150409] N77-33379
Evaluation of analytical methodology for hydrocarbons in high pressure air and nitrogen systems — data aquisition
[NASA-CR-150410] N77-33380
Lattice dynamics and intermolecular potentials for hydrocarbons
N77-34017
HYDRODYNAMICS
Numerical treatment of arbitrarily-shaped regions in fluid dynamics
[AD-A041741] N77-33451
HYDROGEN
Hydrogen solubility in rare earth intermetallic compounds
N77-33288
Analysis of gases in metals: The dc arc gas chromatographic technique. Part 4: Simultaneous determination of H2, O2, and N2 in metals using argon as inert gas medium
[BARC-800-PT-4] N77-33307
Thin film atomic hydrogen detectors
[NASA-CR-152605] N77-33482
Investigations on approximate quantum mechanical wave functions for first period atoms and molecules
N77-33964
HYDROGEN BONDS
High pressure NMR self-diffusion studies of hydrogen bonded and related liquid systems
N77-33294
HYDROGEN IONS
A hollow cathode hydrogen ion source
[NASA-TM-73783] N77-33999
HYDROGEN PRODUCTION
Hydrogen production from coal liquefaction residues
[EPRI-AF-233] N77-33374
HYDROGEOLOGY
Application of remote sensing in South Dakota to provide accurate inventories of agricultural crops, enhance contrast in photographic products, monitor rangeland habitat loss, map Aspen, and prepare hydrogeologic surveys
[E77-10237] N77-33568
HYDROGRAPHY
Seismotectonic, structural, volcanologic, and geomorphic study of New Zealand; indigenous forest assessment in New Zealand; mapping, land use and environmental studies in New Zealand, volume 3
[E77-10235] N77-33566
HYDROLOGY
Seismotectonic, structural, volcanologic, and geomorphic study of New Zealand; indigenous forest assessment in New Zealand; mapping, land use, and environmental studies in New Zealand, volume 1
[E77-10233] N77-33564
TEHM: A Terrestrial Ecosystem Hydrology Model
[EDFB-IBP-76-8] N77-33592
Operations of the National Weather Service
[PB-268041/1] N77-33754
Development of a hydrologic information storage and retrieval system
[PB-268792/9] N77-33765
HYDROXYL RADICALS
Gas phase reactions of OH radicals studied by molecular resonance fluorescence
N77-33283
HYPERBOLIC DIFFERENTIAL EQUATIONS
A boundary value control problem for hyperbolic systems
N77-33908
HYPERSONIC AIRCRAFT
NSEG: A segmented mission analysis program for low and high speed aircraft. Volume 2: Program users manual
[NASA-CR-2808] N77-33100
Subsonic longitudinal aerodynamic characteristics and engine pressure distributions for an aircraft with an integrated scramjet designed for Mach 6 cruise — conducted in Langley 7 by 10 foot high speed tunnel
[NASA-TM-X-73911] N77-33108
HYPERSONIC FLOW
The conically symmetric Navier Stokes equations: Numerical solution for hypersonic cone flow at high angle of attack
[AD-A042072] N77-33123
HYPOKINESIA
Activity of the digestive system during 49-day antiorthostatic human hypokinesia
[NASA-TM-75177] N77-33846
HYPOMETABOLISM
Higher plant metabolism and energetics in hypogravity: Amino acid metabolism in higher plants
[NASA-CR-155198] N77-33840

I

ICE
Ice in space: An experimental and theoretical investigation
[NASA-CR-150417] N77-34067
ICE ENVIRONMENTS
Mariners weather log, volume 21, number 2
[PB-268219/3] N77-33755
ICE FORMATION
Ice in space: An experimental and theoretical investigation
[NASA-CR-150417] N77-34067
ILLINOIS
Economic impact of proposed amendment to water pollution regulations for hexane extractable materials, R74-1, 8, 9
[PB-269184/8] N77-33709
IMAGE CONTRAST
Application of remote sensing in South Dakota to provide accurate inventories of agricultural crops, enhance contrast in photographic products, monitor rangeland habitat loss, map Aspen, and prepare hydrogeologic surveys
[E77-10237] N77-33568
IMAGE ENHANCEMENT
A method of adaptive smoothing and edge enhancement — for image processing
[AD-A041909] N77-33898
IMAGE PROCESSING
A method of adaptive smoothing and edge enhancement — for image processing
[AD-A041909] N77-33898
Dynamic scene analysis: The study of moving images
[AD-A042124] N77-33901
Region tracking using dynamic programming
[AD-A041908] N77-33902
IMAGING TECHNIQUES
Upgrading and testing program for narrow band high resolution planetary IR imaging spectrometer
[NASA-CR-155149] N77-33969
Reconstruction of a source from a few [2 or 3] projections
[LA-6747-MS] N77-33976
IMBEDDINGS [MATHEMATICS]
Immersion and embedding of projective varieties
N77-33906
IMMUNOLOGY
Hematology and immunology studies
N77-33808
IMPACT DAMAGE
Investigation of local damage and impulse delivered to turbine blades by normal and oblique projectile impacts
[AD-A041780] N77-33178
IMPACT TESTS
Guidebook on anthropomorphic test dummy usage
[PB-268904/0] N77-33865
IMPACT TOLERANCES
Tolerance and response of the knee-femur-pelvis complex to axial impact
[PB-269059/2] N77-33864
IMPERIAL VALLEY [CA]
Energy in an oasis: Geothermal resource development in the Imperial Valley of California
N77-33598
IMPLOSIONS
Wundy calculations of the collapse velocities of a staged imploding cylinder
[AD-A041064] N77-33541
Possibility of stable implosion of structured pellet, 1
[IPPJ-293] N77-34001
Formation and adiabatic compression of reversed-field theta pinches in imploding liners
[AD-A041737] N77-34007
IMPULSES
The present technology of impulse radars
[AD-A042094] N77-33394
IMPURITIES
Mossbauer effect studies in iron containing nonmagnetic impurities
[NASA-TM-74067] N77-34018
IN-FLIGHT MONITORING
Methods of improving the performance reliability of advanced military power plant systems
N77-33198
Preliminary results of USAF experience with engine monitoring and diagnostics
N77-33199
Experiment M133. Sleep monitoring on Skylab
N77-33793

Biochemical responses of the Skylab crewmen: An overview
N77-33803
A.I.e. in-flight blood collection system
N77-33825
Body temperature measuring system [M171]
N77-33828
Hardware report for experiment M133, sleep monitoring on Skylab
N77-33829
In-flight medical support system
N77-33832
Carbon dioxide/dewpoint monitor
N77-33833

INCOMPRESSIBLE FLOW
Reservoir flow: Two-phase incompressible flow — using finite element method
[STF71-A74038] N77-33461
Prediction of onset and development of boundary layer transition
[AAAF-NT-77-03] N77-33470
Effect of free stream turbulence on turbulent boundary layers in incompressible flow
[ESA-TT-411] N77-33475

INDEXES [DOCUMENTATION]
Coverage of journal articles by selected US disciplinary science and technology abstracting and indexing services and its relationship to other characteristics of the scientific and technical literature, particularly citations
N77-34036

INDIANA
Application of remote sensing technology to the solution of problems in the management of resources in Indiana
[E77-10223] N77-33554

INDIUM PHOSPHIDES
Indium phosphide Gunn devices, 26-40 GHz
[AD-A041329] N77-33418

INDONESIA
Nuclear power aspects in an oil and coal producing country
[IAEA-CN-36/175] N77-33681

INDUCTORS
User's manual: Computer-aided design programs for inductor-energy-storage dc-to-dc electronic power converters
[NASA-CR-152612] N77-33602

INDUSTRIAL ENERGY
Europe's changing energy relations
[R-2086-ISA] N77-33610

INDUSTRIAL MANAGEMENT
Industrial Productivity Workshop Executive Summary
[PB-267299/6] N77-34031

INDUSTRIAL SAFETY
Translations on USSR science and technology biomedical sciences, no. 12
[JPRS-70017] N77-33844

INDUSTRIAL WASTES
Energy and protein production from pulp mill wastes
[COO-2983-2] N77-33645

INDUSTRIES
Determination of sulfur speciation in industrial aerosols in an SO2 rich environment
[COO-2988-1] N77-33692

INEQUALITIES
An annotated bibliography of selected references on maximal inequalities and their applications
[AD-A042681] N77-33937

INERTIAL NAVIGATION
Conversion of computer software for the gimballed electrostatic gyro navigation system, volume 1
[AD-A041711] N77-33138
Gravity modeling for precise terrestrial inertial navigation
[AD-A042419] N77-33139
The application of the Kalman-Bucy filter theory to the design of feedback networks for Doppler supported inertial navigation systems in flight
[DLR-IB-552-75/18] N77-33141

INFECTIOUS DISEASES
Analysis of the Skylab flight crew health stabilization program
N77-33787

INFORMATION DISSEMINATION
Energy interrelationships. A handbook of tables and conversions factors for combining and comparing international energy data
[PB-269034/5] N77-33675

INFORMATION FLOW
Computer-based supervisory system for managing information flow in C3 systems: Pacing model
[AD-A040359] N77-33391
Perceived environmental uncertainty and the two-step flow process of scientific and technical communication in research and development laboratories
N77-34037

INFORMATION MANAGEMENT
Computer-based supervisory system for managing information flow in C3 systems: Pacing model
[AD-A040359] N77-33391
Space studies of earth resources: Methods and means of measurements and processing of information
[NASA-TT-F-17544] N77-33583
Short term experimental information network: Report to the evaluation subcommittee
[BLL-BLRDR-5369-[2113.56F]]
N77-34042

INFORMATION RETRIEVAL
The BIOSIS data base: Evaluation of its indexes and the STRATBLDR, CHEMFILE, STAIRS and DIALOG systems for on-line searching
[NASA-CR-2893] N77-33869
Coverage of journal articles by selected US disciplinary science and technology abstracting and indexing services and its relationship to other characteristics of the scientific and technical literature, particularly citations
N77-34036
Critical evaluation of data in the physical sciences. A status report on the national standard reference data system, January 1977
[PB-268513/9] N77-34040
Short term experimental information network: Report to the evaluation subcommittee
[BLL-BLRDR-5369-[2113.56F]]
N77-34042

INFORMATION SYSTEMS
Safety information system guide
[ERDA-76-45/9] N77-33384
Earth resources technology system standalone software package: Description and user's guide
[NASA-CR-152598] N77-33591
Development of a hydrologic information storage and retrieval system
[PB-268792/9] N77-33765
The division of information processing labor between user and support system: Exploration of a concept
N77-34035
Short term experimental information network: Report to the evaluation subcommittee
[BLL-BLRDR-5369-[2113.56F]]
N77-34042

INFORMATION THEORY
On measures of dependence: A survey of recent developments
[AD-A041814] N77-33915

INFRARED ASTRONOMY
Point source detection in infrared astronomical surveys
[NASA-CR-152004] N77-34061

INFRARED LASERS
A hydrogen fluoride/deuterium flouride laser at the Naval Postgraduate School
[AD-A042341] N77-33505
Stimulated raman scattering in methane with Nd YAG pump
[AD-A042391] N77-33507
Alignment technique for locating the reflected signal of an infrared laser off a remote target
[SAND-76-0671] N77-33511

INFRARED RADIATION
Rocket radiation handbook. Volume 1: Rocket radiation phenomenology and theory
[AD-A042640] N77-33263
Development of intercalated graphite materials
[AD-A041214] N77-33270

INFRARED SPECTROMETERS
Upgrading and testing program for narrow band high resolution planetary IR imaging spectrometer
[NASA-CR-155149] N77-33969

INFRARED SPECTROSCOPY
The integrated infrared intensities of the fundamental vibrations of acetylene, acetylene d2 and effective charges
N77-33280
The synthesis and characterization of selected copolyoxamides with special emphasis on their complexation behavior
N77-33346

INFRARED WINDOWS
Development of low-cost hardened zinc selenide for IR windows
[AD-A042147] N77-33974

INHOMOGENEITY
The nonlinear distortion of propagation cones of lower hybrid wave in an inhomogeneous plasma
[IPPJ-268] N77-33985

INLET FLOW
Improved computer programs for calculating potential flow in propulsion system inlets
[NASA-TM-73728] N77-33164

INORGANIC COMPOUNDS
Suspended and dissolved solids effects on freshwater biota: A review
[PB-269180/6] N77-33707

INORGANIC NITRATES
Particle size distribution of nitrate aerosols in the Los Angeles air basin
[PB-269349/7] N77-33703

INSTALLING
Study of underground power cable installation methods
[EPRI-EL-374] N77-33432

INSTITUTIONS
Human behavior in institutional fires and its design implications
[NBS-GCR-77-93] N77-33854

INSTRUMENT LANDING SYSTEMS
Measurements of the influence of static and dynamic interference on an ILS-receiver and measurement of the capture effect with the double frequency procedure
[TUBS/SFB58/50] N77-33140

INSTRUMENT ORIENTATION
Alignment technique for locating the reflected signal of an infrared laser off a remote target
[SAND-76-0671] N77-33511

INTAKE SYSTEMS
Analytical and experimental studies of acoustic performance of segmented liners in a compressor inlet
[NASA-CR-2882] N77-33960

INTEGRATED CIRCUITS
Microprocessor Seminar, phase 2
[NASA-CR-155164] N77-33867

INTEGRATED OPTICS
A study of beam couplers for integrated optics
[AD-A042070] N77-33970

INTELLIGIBILITY
A review of the literature on the legibility of alphanumerics on electronic displays
[AD-A040625] N77-33856

INTERFEROMETERS
Medium homogeneity in a chemical laser cavity using a lateral shearing interferometer
[AD-A042504] N77-33508
Applications of the dimensional-measuring laser interferometer in the Oak, Ridge Y-12 Plant Gage Laboratory
[Y-2070] N77-33510

INTERFEROMETRY
Precision surveying using very long baseline interferometry
[NASA-TM-X-71405] N77-33588

INTERMOLECULAR FORCES
Statistics of chain molecules between two adsorbing surfaces
N77-33277
High pressure NMR self-diffusion studies of hydrogen bonded and related liquid systems
N77-33294
Lattice dynamics and intermolecular potentials for hydrocarbons
N77-34017

INTERNAL WAVES
Industrial sound level meter internal noise in octave bands test
[PB-268952/9] N77-33963

INTERNATIONAL COOPERATION
Program plan for ERDA's participation in the IEA working party on energy conservation research and development
[ERDA-77-57] N77-33648

INTERNATIONAL TRADE
Europe's changing energy relations
[R-2086-ISA] N77-33610

INTERPLANETARY FLIGHT
Advanced planetary studies
[NASA-CR-155054] N77-34071

INTERPLANETARY MAGNETIC FIELDS
Heliocentric distance dependence of the interplanetary magnetic field
[NASA-TM-X-71398] N77-34068
Sources of magnetic fields in recurrent interplanetary streams
[NASA-TM-X-71400] N77-34091

INTERPLANETARY MEDIUM
Ice in space: An experimental and theoretical investigation
[NASA-CR-150417] N77-34067
Sources of magnetic fields in recurrent interplanetary streams
[NASA-TM-X-71400] N77-34091

INTERPOLATION
Ultraprecise parabolic interpolator for numerically controlled machine tools
[REPT-40004] N77-33529

INTERRUPTION
Repetitive series interrupter II
[AD-A041144] N77-33419

INTERSYMBOLIC INTERFERENCE
Reduced state viterbi detector demonstration
[AD-A041712] N77-33396

INVISCID FLOW
Finite-difference methods for plane steady inviscid transonic flows
[TRITA-GAD-2] N77-33109
The numerical calculation of steady inviscid supercritical flow past ellipsoids without circulation
[AD-A041016] N77-33453

ION ACOUSTIC WAVES
Computer simulations on the nonlinear frequency shift and nonlinear modulation of ion-acoustic waves
[IPPJ-266] N77-33983
Observation of current-driven ion sound wave in a turbulently heated plasma: The Mach 2
[IPPJ-274] N77-33989

Propagation of nonlinear ion acoustic wave with generation of long-wavelength waves
[IPPJ-297] N77-34005

ION BEAMS
Space processing applications of ion beam technology — surface finishing, welding, milling and film deposition
[NASA-CR-135261] N77-33222
New lens system using toroidal magnetic field for intense ion beams
[IPPJ-264] N77-33981

ION CYCLOTRON RADIATION
Nonlinear electrostatic ion cyclotron waves in an RF-plugged inhomogeneous plasma slab
[IPPJ-275] N77-33990

ION ENGINES
Active experiments in modifying spacecraft potential: Results from ATS-5 and ATS-6
[NASA-CR-152607] N77-33262

ION SOURCES
A hollow cathode hydrogen ion source
[NASA-TM-73783] N77-33999

IONIC DIFFUSION
Diffusion of a multi-ion species plasma due to drift wave fluctuations
[IPPJ-267] N77-33984

IONIC WAVES
Contribution of higher order terms in the reductive perturbation theory. 2: A case of strongly disperive wave
[IPPJ-277] N77-33992

IONIZATION
Field ionization for laser isotope separation
[EPRI-NP-334] N77-33512
Investigations of small scale structure of ionisation in the D region using a Langmuir probe
[WRE-TR-1816[W]] N77-33718
Positive ions in the middle atmosphere during sunrise conditions
[AD-A041799] N77-33732

IONIZATION POTENTIALS
Gas phase X-ray photoelectron spectroscopy of compounds containing multiply-bonded oxygen
N77-33278

IONOSPHERE
Upper atmosphere research bibliography of contaminant release experiments, part 3
[AD-A042565] N77-33733

IONOSPHERIC PROPAGATION
Spatial correlation of transionospheric signal-time-delays
[AD-A041447] N77-33241
Ionosphere/microwave beam interaction study — satellite solar energy conversion
[NASA-CR-151517] N77-33389

IRON ALLOYS
Mechanical properties of several nickel alloys in hydrogen at elevated temperatures
[NASA-CR-150412] N77-33315
Mossbauer effect studies in iron containing nonmagnetic impurities
[NASA-TM-74067] N77-34018

IRON COMPOUNDS
Instrumentation for automatic cycling of lithium-aluminum/iron sulfide secondary cells
[ANL-76-119] N77-33633

IRRIGATION
Application of LANDSAT imagery in land use inventory and classification in Nebraska — Lower and Upper Niobrara area and Sheridan County
[E77-10242] N77-33573

ISLANDS
Seismotectonic, structural, volcanologic, and geomorphic study of New Zealand; indigenous forest assessment in New Zealand; mapping, land use, and environmental studies in New Zealand, volume 1
[E77-10233] N77-33564

ISOLATION
Analysis of the Skylab flight crew health stabilization program
N77-33787

ISOTOPE SEPARATION
Field ionization for laser isotope separation
[EPRI-NP-334] N77-33512

J

JAPAN
Investigation of environmental change pattern in Japan. Classification of shorelines — Nagoya, Yokkaichi, and Ria, Japan
[E77-10224] N77-33555
Investigation of environmental change pattern in Japan. Utilization of LANDSAT-2 data for fisheries
[E77-10227] N77-33558
Application of LANDSAT MSS data to the study of oceanographical environment — Seto Inland Sea
[E77-10228] N77-33559
Significant applications of LANDSAT-2 MSS data to marine environment — Japanese coastal areas
[E77-10229] N77-33560
General pattern of the turbid water in the Seto-inland sea extracted from multispectral imageries by the LANDSAT-1 and 2
[E77-10230] N77-33561
Environmental change pattern in central Japan as revealed by LANDSAT data
[E77-10231] N77-33562
Investigation of environmental change pattern in Japan. Investigation of variations in the prominent oceanic current, Kuroshio
[E77-10232] N77-33563
Investigation of environmental change pattern in Japan. Observation of present state of agricultural land-use by analysing LANDSAT data
[E77-10243] N77-33574
Investigation of environmental change pattern in Japan. Investigation of the ecological environment index from observation of the regional vegetation cover and their growing condition
[E77-10244] N77-33575
An analysis on vegetation cover by using LANDSAT MSS data
[E77-10245] N77-33576

JET AIRCRAFT NOISE
Measurement of far field combustion noise from a turbofan engine using coherence functions
[NASA-TM-73748] N77-33163
High velocity jet noise source location and reduction. Task 4: Development/evaluation of techniques for inflight investigation
[AD-A041849] N77-33175
The effect of flight on the noise of subsonic jets
[AD-A041730] N77-33176

JET ENGINE FUELS
An evaluation of very large airplanes and alternative fuels: Executive summary
[AD-A042112] N77-33154

JET ENGINES
Supersonic jet exhaust noise investigation. Volume 4: Acoustic far-field/near-field data report
[AD-A041819] N77-33177
Military engine deterioration in service connected with life cycle costs
N77-33183
Reliability versus cost in operating wide body jet engines
N77-33186

JET EXHAUST
Pollution reduction technology program for small jet aircraft engines, phase 1
[NASA-CR-135214] N77-33168
Lean premixed/prevaporized combustion
[NASA-CP-2016] N77-33297

JET FLOW
A numerical study of the diurnal variation of the low-level jet
[PB-269484/2] N77-33772

JET IMPINGEMENT
Study of liquid jet impingement on screens
[NASA-CR-135260] N77-33437

JET MIXING FLOW
Fundamental aerodynamic study of local injection in a turbulent boundary layer
[ESA-TT-412] N77-33127

JUPITER PROBES
Report of the Terrestrial Bodies Science Working Group. Volume 7: The Galilean satellites
[NASA-CR-155183] N77-34080

K

KALMAN FILTERS
The application of the Kalman-Bucy filter theory to the design of feedback networks for Doppler supported inertial navigation systems in flight
[DLR-IB-552-75/18] N77-33141

KANSAS
Applications of remote sensing — Texas, South Dakota, North Dakota, and Kansas
[E77-10183] N77-33553

KINETICS
Surface charge kinetics near metal-dielectric interfaces exposed to kilovolt electron flux
[NASA-CR-155195] N77-33411

L

LAKE ONTARIO
Relationship between lake-induced disturbances and synoptic circulation
[PB-269406/5] N77-33741
Analysis of cool season lake-related mesoscale phenomena using numerical variational analysis
[PB-269619/3] N77-33771

LAKES
Application of satellite remote sensing to North Carolina. Development of a monitoring methodology for trophic states of lakes in North Carolina
[NASA-CR-150419] N77-33590

LAMINAR FLOW
Experimental design studies and flow visualization of proportional laminar-flow fluidic amplifiers
[NASA-TN-D-8433] N77-33442
On the stability of two basic parallel flows: Analysis, progress report and proposal for further research
[AD-A041946] N77-33450

LAND USE
Applications of remote sensing — Texas, South Dakota, North Dakota, and Kansas
[E77-10183] N77-33553
Environmental change pattern in central Japan as revealed by LANDSAT data
[E77-10231] N77-33562
Seismotectonic, structural, volcanologic, and geomorphic study of New Zealand; indigenous forest assessment in New Zealand; mapping, land use, and environmental studies in New Zealand, volume 1
[E77-10233] N77-33564
Seismotectonic, structural, volcanologic, and geomorphic study of New Zealand; indigenous forest assessment in New Zealand; mapping, land use and environmental studies in New Zealand, volume 3
[E77-10235] N77-33566
LANDSAT planning applications in east central Florida
[E77-10238] N77-33569
Application of LANDSAT imagery in land use inventory and classification in Nebraska — Lower and Upper Niobrara area and Sheridan County
[E77-10242] N77-33573
Investigation of environmental change pattern in Japan. Observation of present state of agricultural land-use by analysing LANDSAT data
[E77-10243] N77-33574
Predicting changes in land-use patterns resulting from water resource investment using a nonstationary Markov process
[PB-269409/9] N77-33595
Early use of solar energy in buildings. A study of barriers and incentives to the widespread use of solar heating and cooling systems
[PB-267832/4] N77-33618
Regional data center
[PB-268883/6] N77-34056
Land use and arterial spacing in suburban areas
[PB-269353/9] N77-34057

LANDFORMS
The paleomagnetism of the Palisade Sill and the development of the arm correction method of paleointensity determination — anhysteretic remanence
N77-33711

LANDING GEAR
Results of a landing gear loads test using a 0.0405-scale model [16-0] of the space shuttle orbiter in the Rockwell International NAAL wind tunnel [OA163B], volume 1
[NASA-CR-151370] N77-33253
Results of a landing gear loads test using a 0.0405-scale model [16-0] of the space shuttle orbiter in the Rockwell International NAAL wind tunnel [OA163B], volume 2
[NASA-CR-151371] N77-33254

LANDING LOADS
Results of a landing gear loads test using a 0.0405-scale model [16-0] of the space shuttle orbiter in the Rockwell International NAAL wind tunnel [OA163B], volume 1
[NASA-CR-151370] N77-33253
Results of a landing gear loads test using a 0.0405-scale model [16-0] of the space shuttle orbiter in the Rockwell International NAAL wind tunnel [OA163B], volume 2
[NASA-CR-151371] N77-33254

LANDSAT FOLLOW-ON MISSIONS
A cost benefit evaluation of the LANDSAT follow-on program
[NASA-CR-155156] N77-33584

LANTHANUM ALLOYS
Intermetallic compounds containing lanthanides [studies of magnetic anisotropy]
[AD-A041947] N77-34023

LARGE AREA CROP INVENTORY EXPERIMENT
Applications of remote sensing — Texas, South Dakota, North Dakota, and Kansas
[E77-10183] N77-33553

LARGE SCALE INTEGRATION
Microprocessor Seminar, phase 2
[NASA-CR-155164] N77-33867

LASER ANEMOMETERS
Turbulence measurements by laser anemometry
[AAAF-NT-77-07] N77-33473

LASER APPLICATIONS
Laser induced desorption of gas from stainless steel surfaces
[AD-A042323] N77-33325
Laser interference microphone for ultrasonic recordings and nonlinear acoustic investigations
[ISL-R-132/76] N77-33493
Demonstration of rapid-scan two-dimensional laser velocimetry in the Langley Vortex Research Facility for research in aerial applications
[NASA-TM-74081] N77-33497
The use of lidar for stratospheric measurements
[NASA-TM-74085] N77-33498

Optical analysis of a multicolor model of the 360 degree nonprogrammed visual display
[AD-A042092] N77-33499
Field ionization for laser isotope separation
[EPRI-NP-334] N77-33512
LASER CAVITIES
Medium homogeneity in a chemical laser cavity using a lateral shearing interferometer
[AD-A042504] N77-33508
LASER DAMAGE
Response of graphite composites to laser radiation
[AD-A041283] N77-33267
LASER DOPPLER VELOCIMETERS
EPA laser flame analyzer system
[AD-A041216] N77-33501
LASER FUSION
Possibility of stable implosion of structured pellet, 1
[IPPJ-293] N77-34001
LASER OUTPUTS
Photographic study of rapid events by picosecond techniques
[ISL-CO-214/76] N77-33495
Solid-state laser wavelength identification using a reference absorber
[AD-A041689] N77-33503
Magneto-optic development for laser beam steering
[AD-A042985] N77-33509
Laser dynamics and rotational relaxation in chemically formed carbon monoxide. Part 2: Further development and optimization of the chemical CO-laser
[ISL-R-137/76] N77-33514
A study of beam couplers for integrated optics
[AD-A042070] N77-33970
LASER PLASMA INTERACTIONS
Interaction of pulsed CO2 and pulsed HF/DF laser radiation with gaseous and solid targets
[AD-A041486] N77-33500
LASER PUMPING
Stimulated raman scattering in methane with Nd YAG pump
[AD-A042391] N77-33507
LASER RANGE FINDERS
Description of laser spot motion during designation of moving targets
[AD-A041634] N77-33504
LASERS
Study of selected diatomic metal oxides and halides using chemiluminescence and laser-induced flourescence
N77-33291
Surface detail and backscatter from coherently illuminated targets rotating about the axis of symmetry
[AD-A042349] N77-33506
Applications of the dimensional-measuring laser interferometer in the Oak, Ridge Y-12 Plant Gage Laboratory
[Y-2070] N77-33510
LATERAL CONTROL
Orbiter/payload proximity operations: Lateral approach technique
[NASA-TM-74965] N77-33247
LAUNCH VEHICLES
Mathematical model for ascent trajectory optimization of a 4-stage launch vehicle for geosynchronous missions
[ESA-TT-409] N77-33246
LAW [JURISPRUDENCE]
Incentives for the commercialization of Ocean Thermal Energy Conversion Technology [OTEC]
[PB-268097/3] N77-33665
Incentives for the commercialization of Ocean Thermal Energy Conversion technology [OTEC], executive summary
[PB-268096/5] N77-33666
LEAD [METAL]
Study of the auxiliaries for lead-acid battery systems for peaking power
[CONS/2114-3] N77-33634
LEAD COMPOUNDS
Mass spectrometric measurement of velocity distributions of nitrogen molecules in the expansion gas of lead azide after ultrahigh vacuum detonation
[ISL-R-108/76] N77-33308
LEAD TITANATES
Lead zirconate titanate [lzt] ceramics
[AD-A041507] N77-33360
LEAST SQUARES METHOD
DOVE, a rational analysis of sparse data
[AD-A042638] N77-33886
Collection of equations for low-degree least-squares polynomials
[SAND-76-0648] N77-33927
LEG [ANATOMY]
Hemodynamic studies of the legs under weightlessness
N77-33811
Automatic blood pressure measuring system [M091]
N77-33822
Tolerance and response of the knee-femur-pelvis complex to axial impact
[PB-269059/2] N77-33864
LENSES
The theory of diffraction from a holographic lens
[AD-A041537] N77-33486
New lens system using toroidal magnetic field for intense ion beams
[IPPJ-264] N77-33981
LICHENS
Monitoring air quality with lichen: A feasibility study
[NP-21650] N77-33689
LIFE [DURABILITY]
A procedure for predicting the life of turbine engine components
N77-33192
LIFT
An elementary analysis of the effect of sweep, Mach number, and lift coefficient on wing-structure weight
[NASA-TM-74072] N77-33146
LIFTING BODIES
Prediction of static aerodynamic characteristics for slender bodies alone and with lifting surfaces to very high angles of attack
[NASA-TR-R-474] N77-33110
Unsteady supersonic aerodynamic theory for interfering surfaces by the method of potential gradient
[NASA-CR-2898] N77-33121
LIGANDS
Pyrazinecarboxylate, isomeric pyridiniumcarboxylates and isomeric nitrobenzoates as bridging ligands in electron transfer reactions
N77-33295
LIGHT [VISIBLE RADIATION]
Rocket radiation handbook. Volume 1: Rocket radiation phenomenology and theory
[AD-A042640] N77-33263
LIGHT BEAMS
Solid state optics
[AD-A041822] N77-34024
LIGHT SCATTERING
Small-angle X-ray and small-angle light scattering studies of the morphology of polymer blends
N77-33342
LIGHT TRANSMISSION
Investigation of inside light reflection problem on the Flat Plate Canopy [FPC] for model 209 AH-IS helicopter
[AD-A041332] N77-33858
LIGHTNING
Space shuttle program: Lightning protection criteria document
[NASA-TM-74974] N77-33252
LIMNOLOGY
Behavior of mercury, chromium, and cadmium in aquatic systems
[PB-267559/3] N77-33687
Suspended and dissolved solids effects on freshwater biota: A review
[PB-269180/6] N77-33707
LINEAR EQUATIONS
An addition formula for Green's functions
[AD-A041667] N77-33913
Gaussian elimination and numerical instability
[AD-A042159] N77-33919
LINEAR SYSTEMS
A boundary value control problem for hyperbolic systems
N77-33908
Improved convergence for linear systems using three-part splittings
[AD-A041729] N77-33914
Measuring non-stationarity in the parameters of a linear model with applications to asset returns
[AD-A042137] N77-33938
An introduction to the theory of linear systems
[AD-A042690] N77-33939
Error behavior of multistep methods applied to unstable differential systems
[NASA-CR-155169] N77-33941
LINEAR TRANSFORMATIONS
Periodic rings
N77-33947
LININGS
Analytical and experimental studies of acoustic performance of segmented liners in a compressor inlet
[NASA-CR-2882] N77-33960
Formation and adiabatic compression of reversed-field theta pinches in imploding liners
[AD-A041737] N77-34007
LIQUID HYDROGEN
Vapor ingestion in Centaur liquid-hydrogen tank
[NASA-TP-1061] N77-33444
LIQUID INJECTION
Study of liquid jet impingement on screens
[NASA-CR-135260] N77-33437
LIQUID OXYGEN
Evaluation of analytical methodology for hydrocarbons in high pressure air and nitrogen systems — evaluation of methodology
[NASA-CR-150409] N77-33379
Evaluation of analytical methodology for hydrocarbons in high pressure air and nitrogen systems — data aquisition
[NASA-CR-150410] N77-33380
LIQUID PHASES
Heat capacity and enthalpy of liquids. 3: Halogenated ethanes and ethylenes
[ESDU-77007] N77-33273
LITHIUM
Instrumentation for automatic cycling of lithium-aluminum/iron sulfide secondary cells
[ANL-76-119] N77-33633
LITHOLOGY
Structural lineament and pattern analysis of Missouri, using LANDSAT imagery
[E77-10239] N77-33570
LOADING OPERATIONS
Development of a stability monitor/controller for material handling equipment. Phase 2: Hardware development
[AD-A041192] N77-33524
LONG TERM EFFECTS
CFM56 turbofan maintainability and reliability-oriented development
N77-33189
Progress in determining service life by endurance tests — Concorde aircraft
N77-33195
LONGITUDINAL CONTROL
Longitudinal handling qualities during approach and landing of a powered lift STOL aircraft
[NASA-TM-X-62144] N77-33151
LONGITUDINAL STABILITY
Longitudinal handling qualities during approach and landing of a powered lift STOL aircraft
[NASA-TM-X-62144] N77-33151
Entry dynamics of space shuttle orbiter with longitudinal stability and control uncertainties at supersonic and hypersonic speeds
[NASA-TP-1084] N77-33259
LOOP ANTENNAS
Air/undersea communication at ultra-low-frequencies using airborne loop antennas
[AD-A042132] N77-33395
LOSSES
A heterogeneous arrival and service queueing loss model
[AD-A041883] N77-33942
LOSSLESS EQUIPMENT
Modal decomposition and equivalent circuit representations of lossless coupled multiwire lines
N77-33404
LOW TEMPERATURE
Electron-dislocation interaction at low temperatures
[COO-2305-4] N77-34026
LOW VOLTAGE
Manufacturing methods and technology [MMTE] measure for fabrication of low voltage start sealed beam arc lamps
[AD-A041517] N77-33414
LOW WING AIRCRAFT
Spin-tunnel investigation of the spinning characteristics of typical single-engine general aviation airplane designs. 1. Low-wing model A: Effects of tail configurations
[NASA-TP-1009] N77-33111
LUBRICANTS
High pressure and temperature effects on the viscosity, density and bulk modulus of two liquid lubricants
[AD-A041902] N77-33364
Dynamical shear and structural viscoelasticity in elastohydrodynamic lubrication
[AD-A041665] N77-33365
Analysis of film thickness effect in slow-speed lightly-loaded elastrohydrodynamic contacts. Part 3: Experimental measurement of lubricant film thickness
[AD-A041205] N77-33522
LUBRICATING OILS
High pressure and temperature effects on the viscosity, density and bulk modulus of two liquid lubricants
[AD-A041902] N77-33364
LUBRICATION
Lubrication of high-speed, large bore tapered-roller bearings
[NASA-TM-X-73673] N77-33517
Fundamentals of gas lubrication
[AD-A041163] N77-33523
LUBRICATION SYSTEMS
Lubrication of high-speed, large bore tapered-roller bearings
[NASA-TM-X-73673] N77-33517
Design considerations in mechanical face seals for improved performance. 2: Lubrication
[NASA-TM-73736] N77-33518
LUMINESCENCE
Conference on Luminescence Processes in Cathode-ray Tubes and lamps
[AD-A041443] N77-33412
LUNAR ALBEDO
S-191 sensor performance evaluation
[NASA-CR-151527] N77-33582
LUNAR EXPLORATION
Report of the Terrestrial Bodies Science Working Group. Volume 1: Executive summary — Terrestrial planets, Galilean satellites, Comets, Asteroids, and the Moon
[NASA-CR-155189] N77-34074
Report of the Terrestrial Bodies Science Working Group. Volume 4: The moon — lunar polar orbiter mission
[NASA-CR-155186] N77-34077

LUNAR PROBES
Advanced planetary studies
[NASA-CR-155055] N77-34072

M

MACH NUMBER
An elementary analysis of the effect of sweep, Mach number, and lift coefficient on wing-structure weight
[NASA-TM-74072] N77-33146
MACH-ZEHNDER INTERFEROMETERS
Laser interference microphone for ultrasonic recordings and nonlinear acoustic investigations
[ISL-R-132/76] N77-33493
MACHINE TOOLS
Electromechanical machining
[AD-A042545] N77-33527
Ultraprecise parabolic interpolator for numerically controlled machine tools
[REPT-40004] N77-33529
MACHINE TRANSLATION
Bootstrapping a small translator writing system
[AD-A041632] N77-33882
MACHINING
Electromechanical machining
[AD-A042545] N77-33527
MAGNETIC ANOMALIES
Superconducting magnetic calibration source for magnetic anomaly detection MAD operations
[AD-A041738] N77-33421
A study of the marine magnetic anomaly pattern employing techniques based on the Fast Fourier Transform Algorithm
N77-33712
MAGNETIC COILS
Rotational transform angle of the stellarator field with twisted coils
[IPPJ-271] N77-34016
MAGNETIC DOMAINS
Magneto-optic development for laser beam steering
[AD-A042985] N77-33509
MAGNETIC FIELD CONFIGURATIONS
Rotational transform angle of the stellarator field with twisted coils
[IPPJ-271] N77-34016
MAGNETIC FIELDS
On the role of magnetic mirroring in the auroral phenomena
[NASA-CR-155144] N77-33717
New lens system using toroidal magnetic field for intense ion beams
[IPPJ-264] N77-33981
MAGNETIC FLUX
The paleomagnetism of the Palisade Sill and the development of the arm correction method of paleointensity determination --- anhysteretic remanence
N77-33711
Helically symmetric equilibrium of current-carrying finite beta plasma
[IPPJ-270] N77-33987
MAGNETIC MATERIALS
A magnetic fluid seal for measurement of aerodynamic surface pressure
[AD-A040345] N77-33352
MAGNETIC PROPERTIES
Crystal structure and magnetic studies of bis[mu-dibutylphosphinato] copper [II]
[AD-A041510] N77-34020
Intermetallic compounds containing lanthanides [studies of magnetic anisotropy]
[AD-A041947] N77-34023
MAGNETIC RECORDING
High bit rate digital recorder
[AD-A041320] N77-33485
MAGNETIC RESONANCE
The synthesis and characterization of selected copolyoxamides with special emphasis on their complexation behavior
N77-33346
MAGNETIC STORAGE
Memory organizations and their effectiveness for multiprocessing computers
[AD-A042646] N77-33872
MAGNETIC SUSPENSION
Comparative systems study of magnetically suspended flywheels — for stationary satellites with flexible appendages
[ESA-TT-393] N77-33245
MAGNETOHYDRODYNAMIC FLOW
Helically symmetric equilibrium of current-carrying finite beta plasma
[IPPJ-270] N77-33987
MAGNETOHYDRODYNAMIC STABILITY
Theory for space-time evolution of explosive-type instability
[IPPJ-276] N77-33991
Saturation of kink instability and helical equilibrium of current carrying plasma column
[IPPJ-278] N77-33993
On the stability of ballooning modes in the boundary layer of a gas insulated plasma
[TRITA-PFU-77-04] N77-34015
MAGNETOHYDRODYNAMIC WAVES
Experimental investigation of the characteristics of Pc1 micropulsation propagation using a midlatitude five-station receiving network
[AD-A040265] N77-33392
MAGNETOHYDRODYNAMICS
Trapping and detrapping in a single wave and particle acceleration in a magnetoplasma
[IPPJ-263] N77-33980
Nonlinear propagation of the ordinary mode in a hot magnetoplasma
[IPPJ-265] N77-33982
Alternative approaches to plasma confinement
[NASA-TM-X-73793] N77-34000
MAGNETOPAUSE
Electric field topology near the dayside magnetopause
[TRITA-EPP-77-12] N77-33737
Criticism of reconnection models of the magnetopause
[TRITA-EPP-77-13] N77-33738
MAGNETOSPHERE
Problems related to macroscopic electric fields in the magnetosphere
[TRITA-EPP-77-08] N77-33736
Criticism of reconnection models of the magnetopause
[TRITA-EPP-77-13] N77-33738
Interplanetary medium data book
[NASA-TM-X-72614] N77-34065
MAINTENANCE
Military engine deterioration in service connected with life cycle costs
N77-33183
Standardization, certification, maintenance, and dissemination of large scale engineering software systems
[NASA-CP-2015] N77-33876
Maintenance for the NET-2 network analysis program
[AD-A041074] N77-33896
MAN ENVIRONMENT INTERACTIONS
Changes in the composition of the atmosphere and their impact upon climatic variability: An overview
[BMA-24] N77-33761
MAN MACHINE SYSTEMS
A spatial frequency analysis model for predicting human performance at visual pattern matching tasks
[AD-A041649] N77-33859
Interactive system design considerations
[PU1R2/76] N77-33863
Investigation of card programmable and chip programmable packet calculators and calculator systems for use at Naval Post-graduate School and in the naval establishment
[AD-A041067] N77-33870
Writing structured programs in dialog mode
[PU1R4/74] N77-33887
First study of job control languages
[PU1R3/76] N77-33889
Development of a continuous performance measure for manual control
[AD-A041676] N77-33900
An interactive computer aiding system for group decision making
[AD-A041758] N77-34030
MANAGEMENT INFORMATION SYSTEMS
A user's guide to the System/3 data base management system [S3DBMS]
[PB-268875/2] N77-33874
MANAGEMENT METHODS
SKETCHMOD: A policy-oriented modeling process for air quality management
N77-33682
MANAGEMENT PLANNING
Improved engineering-economic model of residential energy use
[ORNL-CON-8] N77-33644
Industrial Productivity Workshop Executive Summary
[PB-267299/6] N77-34031
Impact of competitive procurement on configuration control
[AD-A042876] N77-34034
MANAGEMENT SYSTEMS
Investigation of card programmable and chip programmable packet calculators and calculator systems for use at Naval Post-graduate School and in the naval establishment
[AD-A041067] N77-33870
MANEUVERABILITY
Transonic wind-tunnel investigation of the maneuver potential of the NASA supercritical wing concept, phase 1
[NASA-TM-X-3534] N77-33115
MANIFOLDS [MATHEMATICS]
Decision problems in the fundamental groups of 3-manifolds
N77-33950
MANUAL CONTROL
Development of a continuous performance measure for manual control
[AD-A041676] N77-33900
MANUALS
Rotorcraft flight simulation with coupled rotor aeroelastic stability analysis. Volume 1: Engineer's manual
[AD-A042462] N77-33207
Procedures manual for ground water monitoring at solid waste disposal facilities
[EPA-530/SW-611] N77-34051
MANUFACTURING
Solar collector manufacturing activity
[PB-266985/1] N77-33664
MAPPING
Snowmapping in southern Norway by use of LANDSAT imagery
[E77-10241] N77-33572
Areal mapping of arbitrary plane regions onto rectangular meshes
[UCID-17415] N77-33926
Geologic investigation of Mercury data and the subsequent mapping and explanation of the quadrangle area H-12
[NASA-CR-155159] N77-34070
MAPS
Seismotectonic, structural, volcanologic, and geomorphic study of New Zealand; indigenous forest assessment in New Zealand; mapping, land use, and environmental studies in New Zealand, volume 2
[E77-10234] N77-33565
Regional data center
[PB-268883/6] N77-34056
MARINE BIOLOGY
Marine pastures: A by-product of large [100 megawatt or larger] floating ocean-thermal power plants
[COO-2581-3] N77-33625
MARINE ENVIRONMENTS
Investigation of environmental change pattern in Japan. Utilization of LANDSAT-2 data for fisheries
[E77-10227] N77-33558
Application of LANDSAT MSS data to the study of oceanographical environment --- Seto Inland Sea
[E77-10228] N77-33559
Significant applications of LANDSAT-2 MSS data to marine environment --- Japanese coastal areas
[E77-10229] N77-33560
General pattern of the turbid water in the Seto-inland sea extracted from multispectral imageries by the LANDSAT-1 and 2
[E77-10230] N77-33561
A study of the marine magnetic anomaly pattern employing techniques based on the Fast Fourier Transform Algorithm
N77-33712
Reciprocal acoustic transmission in a mid-ocean environment
N77-33955
MARINE METEOROLOGY
Statistical diagnostic modeling of marine fog using model output parameters
[AD-A042059] N77-33748
Mariners weather log, volume 21, number 2
[PB-268219/3] N77-33755
GATE convection subprogram data center: Comparison of ship-surface, rawinsonde, and tethered sonde wind measurements
[PB-268848/9] N77-33767
US national processing center for GATE: B-scale precipitation data
[PB-270222/3] N77-33770
MARINE RESOURCES
Evaluation of Ocean Color Scanner [OCS] photographic and digital data: Santa Barbara Channel test site, 29 October 1975 overflight
[NASA-CR-155171] N77-33587
MARINER 10 SPACE PROBE
Geologic investigation of Mercury data and the subsequent mapping and explanation of the quadrangle area H-12
[NASA-CR-155159] N77-34070
MARKETING
An economic model of new crude oil and natural gas supplies in the lower 48 states
N77-33596
MARKOV CHAINS
An application of Markovian chains in manpower planning
[AD-A042304] N77-34032
MARKOV PROCESSES
A heterogeneous arrival and service queueing loss model
[AD-A041883] N77-33942
Markovian queueing systems with stochastically varying arrival rates
[AD-A041969] N77-33943
MARS [PLANET]
Thaumasia: A fossilized, early-forming Tharsis uplift
[NASA-TM-X-71404] N77-33710
Report of the Terrestrial Bodies Science Working Group. Volume 5: Mars
[NASA-CR-155185] N77-34078
MARS SURFACE
Computer visual systems for exploratory research
N77-33895

Martian polar geological studies
[NASA-CR-155160] N77-34069

MATERIALS HANDLING
Development of a stability monitor/controller for material handling equipment. Phase 2: Hardware development
[AD-A041192] N77-33524

MATERIALS RECOVERY
Investigation of metal processing operations
[AD-A042188] N77-33326
Systems studies of energy conservation: Methane produced from coalbeds, volume 1
[MERC/CR-77/4-VOL-1] N77-33660
Reliability study of vapor recovery systems at service stations
[PB-267613/8] N77-33700

MATERIALS SCIENCE
Fundamental considerations for future solid lubricants
[NASA-TM-X-52659] N77-33351

MATHEMATICAL LOGIC
Immersion and embedding of projective varieties
N77-33906

MATHEMATICAL MODELS
Airplane math modeling methods for active control design
N77-33212
Mathematical model for ascent trajectory optimization of a 4-stage launch vehicle for geosynchronous missions
[ESA-TT-409] N77-33246
Measurement of solid friction parameters of ball bearings
[AD-A042599] N77-33528
Static and dynamic response calculations for the new Coulport launcher piston assembly
[NCRE/N206] N77-33534
SKETCHMOD: A policy-oriented modeling process for air quality management
N77-33682
Relationship between lake-induced disturbances and synoptic circulation
[PB-269406/5] N77-33741
Automated prediction of thunderstorms and severe local storms
[PB-268035/3] N77-33753
A numerical study of the diurnal variation of the low-level jet
[PB-269484/2] N77-33772
Weather forecasting and weather forecasts: Models, systems and users. Volume 2: Notes from a colloquium
[PB-268914/9] N77-33775
Measuring non-stationarity in the parameters of a linear model with applications to asset returns
[AD-A042137] N77-33938
A heterogeneous arrival and service queueing loss model
[AD-A041883] N77-33942
A polynomial representation of 6-3 micrometers water vapor and 4.3 micrometers CO2 atmospheric transmissivities
[PB-267593/2] N77-33973

MAXIMA
On the average number of maxima in a set of vectors and applications
[AD-A042597] N77-33918

MAXIMUM LIKELIHOOD ESTIMATES
F-8C adaptive flight control extensions — for maximum likelihood estimation
[NASA-CR-2881] N77-33203
Study of the relationships of three factors on errors in inspection
[Y-2075] N77-33531

MEASURE AND INTEGRATION
Revised and enlarged collection of plasma physics formulas and data
[AD-A041545] N77-34006

MEASUREMENT
Atmospheric analyzer, carbon monoxide monitor and toluene diisocyanate monitor
N77-33834

MEASURING INSTRUMENTS
An accurate angular position and angular velocity instrument based on an optical incremental encoder
[WRE-TN-1730(WR/D)] N77-33480
Thin film atomic hydrogen detectors
[NASA-CR-152605] N77-33482
Space studies of earth resources: Methods and means of measurements and processing of information
[NASA-TT-F-17544] N77-33583
Precision surveying using very long baseline interferometry
[NASA-TM-X-71405] N77-33588
Automatic blood pressure measuring system [M091]
N77-33822
Automatic blood pressure measuring system [M092]
N77-33823
Vectorcardiograph
N77-33824
Carbon dioxide/dewpoint monitor
N77-33833

MECHANICAL ENGINEERING
Design considerations in mechanical face seals for improved performance. 2: Lubrication
[NASA-TM-73736] N77-33518
Improved engineering-economic model of residential energy use
[ORNL-CON-8] N77-33644

MEDICAL EQUIPMENT
Skylab medical program overview
N77-33781

MEDICAL SCIENCE
Translation on USSR science and technology biomedical sciences, no. 9
[JPRS-69899] N77-33841
Translations on USSR science and technology biomedical sciences, no. 10
[JPRS-69924] N77-33842

MERCURY [METAL]
Behavior of mercury, chromium, and cadmium in aquatic systems
[PB-267559/3] N77-33687

MERCURY [PLANET]
Geologic investigation of Mercury data and the subsequent mapping and explanation of the quadrangle area H-12
[NASA-CR-155159] N77-34070
Report of the Terrestrial Bodies Science Working Group. Volume 2: Mercury
[NASA-CR-155188] N77-34075

MESSAGES
An implementation of the MSG interprocess communication protocol
[AD-A041630] N77-33871

METABOLISM
Red cell metabolism studies on Skylab
N77-33807
Results of Skylab medical experiment M171-metabolic activity
N77-33816
Metabolic cost of extravehicular activities
N77-33818
Metabolic analyzer
N77-33827
Higher plant metabolism and energetics in hypogravity: Amino acid metabolism in higher plants
[NASA-CR-155198] N77-33840

METAL COATINGS
Method for the rapid temperature measurement of silver surfaces
[ISL-R-115/76] N77-33490

METAL FATIGUE
Mechanical properties of several nickel alloys in hydrogen at elevated temperatures
[NASA-CR-150412] N77-33315

METAL FOILS
High speed foil breakers
[UCRL-TRANS-11226] N77-33428
Study of electric explosion of cylindrical foils in air
[UCRL-TRANS-11227] N77-33429

METAL OXIDES
Study of selected diatomic metal oxides and halides using chemiluminescence and laser-induced flourescence
N77-33291

METAL SPRAYING
Optical properties of chemically sprayed CdS/Cu/sub x/S photovoltaic cells
[SAND-76-0729] N77-33656

METAL SURFACES
Temperature programmed exchange studies of supported metal catalysts
N77-33281
Hydrogen solubility in rare earth intermetallic compounds
N77-33288
Reactions and electrochemical kinetics of newly-generated metal surfaces
[AD-A036570] N77-33317
Surface charge kinetics near metal-dielectric interfaces exposed to kilovolt electron flux
[NASA-CR-155195] N77-33411

METAL-METAL BONDING
Air bonded, FOD resistant metal matrix fan blades
[AD-A041492] N77-33170

METALLOIDS
Superconductivity of polar many-valley semiconductors and semimetals
[NASA-TM-75141] N77-33410

METALS
Analysis of gases in metals: The dc arc gas chromatographic technique. Part 4: Simultaneous determination of H2, O2, and N2 in metals using argon as inert gas medium
[BARC-800-PT-4] N77-33307
The effect of grain size on thermal diffusion in metals
[AD-A041532] N77-33321
Displacement cross sections and PKA spectra: Tables and applications
[HEDL-TME-76-70] N77-33332
Role of stress effects in the oxidation behavior of high temperature alloys
[CONF-761057-4] N77-33333
Analysis of radar detection of agitated metals [RADAM]
[AD-A041713] N77-33397
Computer technology in materials analysis. Part 1: Metals and alloys
[AD-A041031] N77-33877
Green's function calculation of a metal-metal interface
[AD-A041918] N77-34019

METEOROLOGICAL INSTRUMENTS
Calibration technology for meteorological satellites
[AD-A041662] N77-33750

METEOROLOGICAL PARAMETERS
Environmental change pattern in central Japan as revealed by LANDSAT data
[E77-10231] N77-33562
The 12817A Lance missile number 4106, round number 295 RCL
[AD-A041448] N77-33744
The 12815C Lance missile number 4043, round number 294 RSL
[AD-A041453] N77-33745
The 17901AT Honest John missile numbers 1483/1494 round numbers 656 ASL/658 ASL
[AD-A041449] N77-33746
Calibration technology for meteorological satellites
[AD-A041662] N77-33750
Development of a hydrologic information storage and retrieval system
[PB-268792/9] N77-33765
US national processing center for GATE: B-scale surface meteorological and radiation system, including instrumentation, processing, and archived data
[PB-268816/6] N77-33766
Research study on dynamics of the solar atmosphere
[AD-A035939] N77-34088

METEOROLOGICAL RADAR
An examination of probability of precipitation forecasts in light of rainfall areal coverage
[PB-268761/4] N77-33758

METEOROLOGICAL RESEARCH AIRCRAFT
Mission definition for the first flight of a multidisciplinary lidar system formulated following discussions with representatives of various institutes
[DLR-IB-553-76/4] N77-33513

METEOROLOGICAL SATELLITES
Calibration technology for meteorological satellites
[AD-A041662] N77-33750
Gulfstream: Monthly publications, January-December 1976. Volume 2, numbers 1-12
[PB-268216/9] N77-33779

METHANE
Stimulated raman scattering in methane with Nd YAG pump
[AD-A042391] N77-33507
Biological conversion of biomass to methane
[COO-2917-76-2] N77-33627
Systems studies of energy conservation: Methane produced from coalbeds, volume 1
[MERC/CR-77/4-VOL-1] N77-33660
Systems studies of energy conservation: Methane produced from coalbeds, volume 2
[MERC/CR-77/4-VOL-2] N77-33661

METHYL ALCOHOLS
The coulometric dissolution and electrochemical behavior of titanium anodes in methanol
N77-33276
Physical properties of gasoline/methanol mixtures
[BERC/RI-76/12] N77-33375

MICHIGAN
Report of the Advisory Commission on Electric Power Alternatives
[PB-268479/3] N77-33668

MICROELECTRONICS
Solderability testing of microcircuits
[AD-A041203] N77-33413

MICROORGANISMS
Skylab environmental and crew microbiology studies
N77-33788

MICROPHONES
Laser interference microphone for ultrasonic recordings and nonlinear acoustic investigations
[ISL-R-132/76] N77-33493

MICROPROCESSORS
Development of a stability monitor/controller for material handling equipment. Phase 2: Hardware development
[AD-A041192] N77-33524
Feasibility study of microprocessor systems suitable for use in developing a real-time for the 4.75 GHz scatterometer
[NASA-CR-151522] N77-33586
Microprocessor Seminar, phase 2
[NASA-CR-155164] N77-33867

MICROPULSATIONS
Experimental investigation of the characteristics of Pc1 micropulsation propagation using a midlatitude five-station receiving network
[AD-A040265] N77-33392

MICROWAVE AMPLIFIERS
Millimeter wave gyrotron development, phase 1
[AD-A041596] N77-33415

Indium phosphide Gunn devices, 26-40 GHz
[AD-A041329] N77-33418
Low cost crossed-field amplifier
[AD-A042666] N77-33425

MICROWAVE CIRCUITS
A new analysis of n-way hybrid power dividers with equiamplitudes
N77-33406
A new analysis of n-way hybrid power dividers with arbitrary power splitting ratios
N77-33407
A constant-resistance power divider using single-element couplers and its optimum design for wide bandwidth
N77-33408

MICROWAVE EQUIPMENT
Development of microwave plasma detoxification process for hazardous wastes, phase
[PB-268526/1] N77-34055

MICROWAVE SCANNING BEAM LANDING SYSTEM
Multipath and performance tests of TRSB receivers
[AD-A041891] N77-33135

MICROWAVE SPECTROMETERS
The 2-8 GHz solar dynamic spectra and polarization measurement feasibility study
[NASA-CR-152604] N77-34085

MICROWAVE TRANSMISSION
Ionosphere/microwave beam interaction study — satellite solar energy conversion
[NASA-CR-151517] N77-33389
A constant-resistance power divider using single-element couplers and its optimum design for wide bandwidth
N77-33408

MICROWAVES
Feasibility and systems definition study for Microwave Multi-Application Payload [MMAP]
[NASA-CR-152611] N77-33251
Earth-space attenuation prediction procedures at 4 to 16 GHz
[PB-269228/3] N77-33402
Biological effects of electromagnetic waves. Selected papers of the USNC/URSI Annual Meeting, volume 2
[PB-268095/7] N77-33853

MIDAIR COLLISIONS
Aircraft accident report. Midair collision. Reeds Aviation, Inc., Piper PA-28R-200, N7941C, and Piper-28-181, N8592C, near Huntsville, Missouri, 24 July 1976
[NTISUB/C/104-002] N77-33133

MILITARY OPERATIONS
Standard spacecraft economic analysis. Volume 1: Executive summary
[NASA-CR-152538] N77-33224

MILITARY TECHNOLOGY
An assessment of the role of simulators in military flight training. Volume 1: Assessment based on survey interviews
[AD-A041222] N77-33217
Alternate petroleum based fuels for naval fleet usage: potential availability, cost, and system impact
[AD-A041980] N77-33372
DoD energy R And D. Part 2: Military fuel operations. Performance and R and D implications
[AD-A042272] N77-33617

MILLIMETER WAVES
Millimeter-wave antenna design
[NASA-CR-152608] N77-33409

MILLING
Space processing applications of ion beam technology — surface finishing, welding, milling and film deposition
[NASA-CR-135261] N77-33222

MINERAL DEPOSITS
Structural lineament and pattern analysis of Missouri, using LANDSAT imagery
[E77-10239] N77-33570

MINERAL METABOLISM
Mineral and nitrogen metabolic studies, experiment M071
N77-33798

MINERALS
Electron microprobe analyses of minerals in Precambrian rocks at the Los Alamos Scientific Laboratory Geothermal Test Site, Temez Mountains, New Mexico
[LA-6695-MS] N77-33734
Preliminary studies of the alteration of a granite by an artificial hydrothermal system
[LA-6696-MS] N77-33735

MINES [EXCAVATIONS]
Underground coal mine instrumentation and test
[NASA-CR-150045] N77-33479

MINIATURE ELECTRONIC EQUIPMENT
Manufacturing methods and techniques for miniature high voltage hybrid multiplier modules
[AD-A041765] N77-33423
Tactical miniature crystal oscillator
[AD-A041411] N77-33436

MINICOMPUTERS
Development and construction of the small data acquisition system MINIDIG — for use on motor gliders ASK 16
[DLR-IB-553-76/6] N77-33492

MINIMAX TECHNIQUE
Minimax subset selection with applications to unequal variance problems
[AD-A041744] N77-33917
An annotated bibliography of selected references on maximal inequalities and their applications
[AD-A042681] N77-33937

MINING
Underground coal mine instrumentation and test
[NASA-CR-150045] N77-33479
Systems studies of energy conservation: Methane produced from coalbeds, volume 1
[MERC/CR-77/4-VOL-1] N77-33660

MINUTEMAN ICBM
Propellant surveillance report LGM-30 F and G stage. Phase E: Series 3, TP-H1011
[AD-A041671] N77-33373

MIRRORS
Alignment technique for locating the reflected signal of an infrared laser off a remote target
[SAND-76-0671] N77-33511
Mirror reactor surface study
[UCID-17168] N77-34012

MISSILE TRAJECTORIES
Assessment of a dynamical gyroscope model utilizing digital simulation techniques
[AD-A042497] N77-33488

MISSILES
The 12817A Lance missile number 4106, round number 295 RCL
[AD-A041448] N77-33744

MISSION PLANNING
NSEG: A segmented mission analysis program for low and high speed aircraft. Volume 2: Program users manual
[NASA-CR-2808] N77-33100
A study of selected environmental quality remote sensors for free flyer missions launched from the space shuttle
[NASA-CR-145252] N77-33585
Space shuttle life sciences requirements development and documentation
[NASA-CR-151529] N77-33838
Advanced planetary studies
[NASA-CR-155054] N77-34071
Advanced planetary studies
[NASA-CR-155055] N77-34072
Report of the Terrestrial Bodies Science Working Group. Volume 1: Executive summary — Terrestrial planets, Galilean satellites, Comets, Asteroids, and the Moon
[NASA-CR-155189] N77-34074
Report of the Terrestrial Bodies Science Working Group. Volume 2: Mercury
[NASA-CR-155188] N77-34075
Report of the Terrestrial Bodies Science Working Group. Volume 3: Venus
[NASA-CR-155187] N77-34076
Report of the Terrestrial Bodies Science Working Group. Volume 4: The moon — lunar polar orbiter mission
[NASA-CR-155186] N77-34077
Report of the Terrestrial Bodies Science Working Group. Volume 5: Mars
[NASA-CR-155185] N77-34078
Report of the Terrestrial Bodies Science Working Group. Volume 6: The asteroids
[NASA-CR-155184] N77-34079
Report of the Terrestrial Bodies Science Working Group. Volume 7: The Galilean satellites
[NASA-CR-155183] N77-34080
Report of the Terrestrial Bodies Science Working Group. Volume 8: The comets
[NASA-CR-155181] N77-34081
Report of the Terrestrial Bodies Science Working Group. Volume 9: Complementary research and development
[NASA-CR-155181] N77-34082

MISSOURI
Aircraft accident report. Midair collision. Reeds Aviation, Inc., Piper PA-28R-200, N7941C, and Piper-28-181, N8592C, near Huntsville, Missouri, 24 July 1976
[NTISUB/C/104-002] N77-33133
Structural lineament and pattern analysis of Missouri, using LANDSAT imagery
[E77-10239] N77-33570

MIXING
Cement content of fresh concrete
[PB-266931/5] N77-33549

MODELS
An economic model of new crude oil and natural gas supplies in the lower 48 states
N77-33596
Improved engineering-economic model of residential energy use
[ORNL-CON-8] N77-33644

MODEMS
Air traffic control experimentation and evaluation test
[AD-A041971] N77-33136

MODULAR INTEGRATED UTILITY SYSTEM
Preliminary design study of a baseline MIUS
[NASA-TM-X-58193] N77-34050

MODULUS OF ELASTICITY
High pressure and temperature effects on the viscosity, density and bulk modulus of two liquid lubricants
[AD-A041902] N77-33364

MOISTURE
Moisture distribution modification by upward vertical motion
[PB-268740/8] N77-33763

MOISTURE CONTENT
Improved nuclear gage development phase 1 and 2
[PB-267106/3] N77-33496

MOISTURE METERS
Improved nuclear gage development phase 1 and 2
[PB-267106/3] N77-33496

MOLECULAR BEAMS
Scattering of rotational state selected C sF molecules by low energy electrons, 1. Determination of the surface disulfide bridge in proteins by pulse radiolysis, 2
N77-33290

MOLECULAR CHAINS
Statistics of chain molecules between two adsorbing surfaces
N77-33277

MOLECULAR COLLISIONS
Mass filtering and velocity analysis of products of single collision reactions of barium with alkali halides
N77-33282

MOLECULAR DIFFUSION
High pressure NMR self-diffusion studies of hydrogen bonded and related liquid systems
N77-33294

MOLECULAR INTERACTIONS
Statistics of chain molecules between two adsorbing surfaces
N77-33277
High pressure NMR self-diffusion studies of hydrogen bonded and related liquid systems
N77-33294
Synthesis of polyimides curable by intramolecular cycloaddition
[AD-A041420] N77-33355
Oscillatory indirect interaction between adsorbed atoms
[AD-A042376] N77-33967

MOLECULAR ORBITALS
Gas phase X-ray photoelectron spectroscopy of compounds containing multiply-bonded oxygen
N77-33278
The understanding of molecular properties by both experimental and theoretical methods: The localized molecular orbitals of transition metal complexes, and the ionization potentials of n-alkenes
N77-33284

MOLECULAR RELAXATION
Laser dynamics and rotational relaxation in chemically formed carbon monoxide. Part 2: Further development and optimization of the chemical CO-laser
[ISL-R-137/76] N77-33514

MOLECULAR ROTATION
Scattering of rotational state selected C sF molecules by low energy electrons, 1. Determination of the surface disulfide bridge in proteins by pulse radiolysis, 2
N77-33290

MOLECULAR SPECTRA
Raman spectra of molecules with anharmonic vibrations in the gaseous and solid phases
N77-33287

MOLECULAR SPECTROSCOPY
Gas phase reactions of OH radicals studied by molecular resonance fluorescence
N77-33283

MOLECULAR STRUCTURE
Dielectric constants, pair interactions and molecular shape of polar molecules
N77-33293

MOLECULES
Collisional dissociation and structural properties of atmospheric negative ions
[AD-A042111] N77-33730

MONITORS
Master monitor display application study for F-14
[AD-A041570] N77-33158

MONSOONS
A numerical experiment of the development of the zonally symmetric northern summer monsoon
[AD-A042103] N77-33749

MONTE CARLO METHOD
Monte Carlo simulation of VOR/DME holding procedures. Basic notions and applications
[ESA-TT-419] N77-33142
Stochastic approximation algorithms for the sequential Monte Carlo optimization of stochastic systems
N77-33928

MOON
Report of the Terrestrial Bodies Science Working Group. Volume 4: The moon — lunar polar orbiter mission
[NASA-CR-155186] N77-34077

MOSSBAUER EFFECT
Mossbauer effect studies in iron containing nonmagnetic impurities
[NASA-TM-74067] N77-34018

MOTION
Dynamic scene analysis: The study of moving images
[AD-A042124] N77-33901

MOTOR VEHICLES
Overview and review of motor gasoline desulfurization, volume 1
[BERC/RI-76/17-VOL-1] N77-33377
Motor gasoline desulfurization study, volume 2
[BERC/RI-76/17-VOL-2] N77-33378
Evaluation methodology for federal motor vehicle safety standards. Volume 1: Executive summary
[PB-266936/4] N77-33381
Evaluation methodology for federal motor vehicle safety standards. Volume 2: Technical findings
[PB-266937/2] N77-33382
Assessment of service requirements and design characteristics of present and future paratransit vehicles
[PB-267574/2] N77-33699
Tolerance and response of the knee-femur-pelvis complex to axial impact
[PB-269059/2] N77-33864

MOUNTAINS
Structural lineament and pattern analysis of Missouri, using LANDSAT imagery
[E77-10239] N77-33570
Snowmapping in southern Norway by use of LANDSAT imagery
[E77-10241] N77-33572

MULTIMISSION MODULAR SPACECRAFT
A study of selected environmental quality remote sensors for free flyer missions launched from the space shuttle
[NASA-CR-145252] N77-33585

MULTIPROCESSING (COMPUTERS)
Memory organizations and their effectiveness for multiprocessing computers
[AD-A042646] N77-33872

MULTISPECTRAL BAND CAMERAS
Sensor performance report, volume 4 [S-190A]
[NASA-CR-151528] N77-33581

MULTISPECTRAL BAND SCANNERS
Evaluation of Ocean Color Scanner [OCS] photographic and digital data: Santa Barbara Channel test site, 29 October 1975 overflight
[NASA-CR-155171] N77-33587

MULTIVARIATE STATISTICAL ANALYSIS
Output feedback regulator design for jet engine control systems
[NASA-TM-73776] N77-33165
On measures of dependence: A survey of recent developments
[AD-A041814] N77-33915
Testing significance of a mean vector: A possible alternative to Hotellings T squared
[AD-A042644] N77-33920

MUSCLES
Investigate methods for measuring muscle and bone mass changes in astronauts and animals which occur during space flight
[NASA-CR-151518] N77-33837

MUSCULAR FUNCTION
Changes in the Achilles tendon reflexes following Skylab missions
N77-33795
Muscular deconditioning and its prevention in space flight
N77-33801

N

NAPHTHENES
Synthesis of 1,9,10-anthyridines and annelation fo 1,8-naphthyridine units via Friedlander condensation
N77-33341

NASA PROGRAMS
Standard spacecraft economic analysis. Volume 1: Executive summary
[NASA-CR-152538] N77-33224
Spinoff 1977: An annual report
[NASA-TM-74908] N77-34049

NATURAL GAS
An economic model of new crude oil and natural gas supplies in the lower 48 states
N77-33596

NAVIER-STOKES EQUATION
The conically symmetric Navier Stokes equations: Numerical solution for hypersonic cone flow at high angle of attack
[AD-A042072] N77-33123
Development of a three-dimensional combustor flow analysis. Volume 2: Theoretical studies
[AD-A042122] N77-33302
A numerical study of nonlinear effects on boundary-layer stability
[AD-A041088] N77-33446
Derivation of conservative finite difference expressions for the Navier-Stokes equations
[K/CSD-5] N77-33455

NAVIGATION AIDS
Calibration of Viking imaging system pointing, image extraction, and optical navigation measure
[NASA-CR-155165] N77-33235

NEAR FIELDS
Supersonic jet exhaust noise investigation. Volume 4: Acoustic far-field/near-field data report
[AD-A041819] N77-33177

NEBRASKA
Application of LANDSAT imagery in land use inventory and classification in Nebraska — Lower and Upper Niobrara area and Sheridan County
[E77-10242] N77-33573

NEODYMIUM LASERS
Laser induced desorption of gas from stainless steel surfaces
[AD-A042323] N77-33325

NERNST-ETTINGSHAUSEN EFFECT
On the stability of ballooning modes in the boundary layer of a gas insulated plasma
[TRITA-PFU-77-04] N77-34015

NETWORK ANALYSIS
Equivalent circuit representation of coupled multiwire line and its application
[MONO-24-1977] N77-33403
A new analysis of n-way hybrid power dividers with equiamplitudes
N77-33406
A new analysis of n-way hybrid power dividers with arbitrary power splitting ratios
N77-33407
Maintenance for the NET-2 network analysis program
[AD-A041074] N77-33896

NEUTRON IRRADIATION
The effects of fast and thermal neutron flux and gamma radiation on the transmission characteristics of optical fibers
[AD-A042429] N77-33975

NEW JERSEY
The paleomagnetism of the Palisade Sill and the development of the arm correction method of paleointensity determination — anhysteretic remanence
N77-33711

NEW MEXICO
Spectral measurement of watershed coefficients in the southern Great Plains — Texas, Arizona, and New Mexico
[E77-10225] N77-33556
Solar radiation availability for New Mexico
[SAND-77-0004] N77-33654
Electron microprobe analyses of minerals in Precambrian rocks at the Los Alamos Scientific Laboratory Geothermal Test Site, Temez Mountains, New Mexico
[LA-6695-MS] N77-33734

NEW YORK
Meteorological forcing fields of the New York bight
[PB-269442/0] N77-33774

NEW ZEALAND
Seismotectonic, structural, volcanologic, and geomorphic study of New Zealand; indigenous forest assessment in New Zealand; mapping, land use, and environmental studies in New Zealand, volume 1
[E77-10233] N77-33564
Seismotectonic, structural, volcanologic, and geomorphic study of New Zealand; indigenous forest assessment in New Zealand; mapping, land use, and environmental studies in New Zealand, volume 2
[E77-10234] N77-33565
Seismotectonic, structural, volcanologic, and geomorphic study of New Zealand; indigenous forest assessment in New Zealand; mapping, land use and environmental studies in New Zealand, volume 3
[E77-10235] N77-33566

NEWTON THEORY
Dynamics of continua and particles from general covariance of Newtonian gravitation theory
[CNRS-CPT-76-P-849] N77-34029

NICKEL ALLOYS
Mechanical properties of several nickel alloys in hydrogen at elevated temperatures
[NASA-CR-150412] N77-33315
Deformation behaviour of Ti-50.3 at Ni alloy
[LBL-5103] N77-33331

NICKEL CADMIUM BATTERIES
Review of electrochemical impregnation for nickel cadmium cells — aerospace applications
[NASA-CR-155155] N77-33601

NICKEL ZINC BATTERIES
Design and cost study of a zinc/nickel oxide battery for electric vehicle propulsion
[ANL-K-76-3543-1] N77-33635

NIGHT
The energy balance of the nighttime thermosphere
[NASA-CR-155194] N77-33721

NIOBIUM ALLOYS
Power transmission project
[BNL-22202] N77-33426

NITROGEN
Analysis of gases in metals: The dc arc gas chromatographic technique. Part 4: Simultaneous determination of H2, O2, and N2 in metals using argon as inert gas medium
[BARC-800-PT-4] N77-33307
Mass spectrometric measurement of velocity distributions of nitrogen molecules in the expansion gas of lead azide after ultrahigh vacuum detonation
[ISL-R-108/76] N77-33308
Evaluation of analytical methodology for hydrocarbons in high pressure air and nitrogen systems — evaluation of methodology
[NASA-CR-150409] N77-33379
Evaluation of analytical methodology for hydrocarbons in high pressure air and nitrogen systems — data aquisition
[NASA-CR-150410] N77-33380

NITROGEN METABOLISM
Mineral and nitrogen metabolic studies, experiment M071
N77-33798

NOISE INJURIES
Noise induced hearing loss. Noise evaluation. The use of hearing protectors
[NTNF-4] N77-33852

NOISE INTENSITY
The effect of psychophysical method on the loudness of continuous and interrupted pure tones
N77-33954

NOISE MEASUREMENT
Over-the-wing model thrust reverser noise tests
[NASA-TM-73495] N77-33161
Identification and measurement of combustion noise from a turbofan engine using correlation and coherence techniques
[NASA-TM-73747] N77-33162
Measurement of far field combustion noise from a turbofan engine using coherence functions
[NASA-TM-73748] N77-33163
Need for noise standards
[ELAB-STF44-A75044] N77-33962
Industrial sound level meter internal noise in octave bands test
[PB-268952/9] N77-33963

NOISE METERS
Industrial sound level meter internal noise in octave bands test
[PB-268952/9] N77-33963

NOISE POLLUTION
Further sensitivity studies of community-aircraft noise exposure [NOISEMAP] prediction procedures
[AD-A041781] N77-33686

NOISE REDUCTION
Study of noise and inflow distortion sources in the NASA QF-1B fan using measured blade and vane pressures
[NASA-CR-2899] N77-33113
State-of-the-art of turbofan engine noise control
[NASA-TM-73734] N77-33166
High velocity jet noise source location and reduction. Task 4: Development/evaluation of techniques for inflight investigation
[AD-A041849] N77-33175
Investigation of feasible nozzle configurations for noise reduction in turbofan and turbojet aircraft. Volume 3: Shrouded slot nozzle configurations
[AD-A041782] N77-33179
Airplane noise: Dimensions and means of noise reduction — in Norway
[ELAB-STF44-A75080] N77-33696
Inspection of Federal facilities for compliance with noise abatement standards
[PB-269298/6] N77-33704
A research program to reduce interior noise in general aviation airplanes. Design of an acoustic panel test facility
[NASA-CR-155152] N77-33957
A research to reduce interior noise in general aviation airplanes. General aviation interior noise study
[NASA-CR-155153] N77-33958
A research program to reduce interior noise in general aviation airplanes — test methods and results
[NASA-CR-155154] N77-33959
Analytical and experimental studies of acoustic performance of segmented liners in a compressor inlet
[NASA-CR-2882] N77-33960

NOISE TOLERANCE
Frequency dependence of impulse noise attenuation — hazard to hearing
[AD-A042031] N77-33961

NONAQUEOUS ELECTROLYTES
Solid polymer electrolyte [SPE] fuel cell technology program, phase 1/1A — design and fabrication
[NASA-CR-151506] N77-33605
Solid polymer electrolyte [SPE] fuel cell technology program, phase 2/2A — testing and evaluations
[NASA-CR-151507] N77-33606

NONEQUILIBRIUM PLASMAS
Saturation of kink instability and helical equilibrium of current carrying plasma column
[IPPJ-278] N77-33793

NONLINEAR EQUATIONS
Nonlinear aeroelastic equations for combined flapwise bending, chordwise bending, torsion, and extension of twisted nonuniform rotor blades in forward flight
[NASA-TM-74059] N77-33107

NONLINEAR PROGRAMMING
Minimum time acceleration of aircraft turbofan engines by using an algorithm based on nonlinear programming
[NASA-TM-73741] N77-33167
On the reconstruction of the covariance of stationary Gaussian processes observed through zero memory nonlinearities
[AD-A041812] N77-33934

NONLINEAR SYSTEMS
Nonlinear anelastic behavior of a synthetic rubber at finite strains
[AD-A041777] N77-33363
A numerical study of nonlinear effects on boundary-layer stability
[AD-A041088] N77-33446
Observability and identifiability of nonlinear dynamical systems with an application to the optional control model for the human operator
[AD-A041794] N77-33899
Space and time evolution of two nonlinearly coupled variables: Special solutions
[IPPJ-273] N77-33910
Computer simulations on the nonlinear frequency shift and nonlinear modulation of ion-acoustic waves
[IPPJ-266] N77-33983
The nonlinear distortion of propagation cones of lower hybrid wave in an inhomogeneous plasma
[IPPJ-268] N77-33985
Nonlinear electrostatic ion cyclotron waves in an RF-plugged inhomogeneous plasma slab
[IPPJ-275] N77-33990
Nonlinear heat and particle transport due to collisional drift waves
[IPPJ-281] N77-33996

NONUNIFORM PLASMAS
The nonlinear distortion of propagation cones of lower hybrid wave in an inhomogeneous plasma
[IPPJ-268] N77-33985

NORMAL DENSITY FUNCTIONS
A study of power transforms
[AD-A041985] N77-33912
On the reconstruction of the covariance of stationary Gaussian processes observed through zero memory nonlinearities
[AD-A041812] N77-33934

NORMALITY
A differential for L-statistics
[AD-A042683] N77-33936

NORTH ATLANTIC TREATY ORGANIZATION [NATO]
NATO standardization versus US data releasability: An approach to resolving the conflict
[AD-A042959] N77-34053

NORTH CAROLINA
Application of satellite remote sensing to North Carolina. Development of a monitoring methodology for trophic states of lakes in North Carolina
[NASA-CR-150419] N77-33590

NORTH DAKOTA
Applications of remote sensing — Texas, South Dakota, North Dakota, and Kansas
[E77-10183] N77-33553

NORWAY
Snowmapping in southern Norway by use of LANDSAT imagery
[E77-10241] N77-33572
Airplane noise: Dimensions and means of noise reduction — in Norway
[ELAB-STF44-A75080] N77-33696

NOSE CONES
The conically symmetric Navier Stokes equations: Numerical solution for hypersonic cone flow at high angle of attack
[AD-A042072] N77-33123

NOZZLE DESIGN
Propulsion nozzle studies. Volume 2: Design of maximum thrust nozzle-base-boattail contours
[AD-A041530] N77-33174

NOZZLE FLOW
CL XI nozzle F2 absorption experiment
[AD-A041566] N77-33515

NOZZLE THRUST COEFFICIENTS
Propulsion nozzle studies. Volume 2: Design of maximum thrust nozzle-base-boattail contours
[AD-A041530] N77-33174

NUCLEAR ELECTRIC POWER GENERATION
Public acceptance of nuclear power
[IAEA-CN-36/507] N77-33630
Net energy from nuclear power
[IAEA-CN-36/399] N77-33676
Role of nuclear power in meeting future U.S. energy needs
[IAEA-CN-36/396] N77-33677
Technical and economic studies of small reactors for supply of electricity and steam
[IAEA-CN-36/398] N77-33678
Nuclear power aspects in an oil and coal producing country
[IAEA-CN-36/175] N77-33681
Survey of nuclear fuel cycle economics: 1970 - 1985
[ORNL-TM-5703] N77-33968

NUCLEAR FUELS
Net energy from nuclear power
[IAEA-CN-36/399] N77-33676
Role of nuclear power in meeting future U.S. energy needs
[IAEA-CN-36/396] N77-33677
Survey of nuclear fuel cycle economics: 1970 - 1985
[ORNL-TM-5703] N77-33968
Fusion systems engineering
[BNWL-1939-6] N77-34013

NUCLEAR FUSION
Sandia Laboratories energy programs
[SAND-77-0034] N77-33629
Effects of nuclear fusion on reaction on diffusion and thermal conduction in a magnetoplasma
[IPPJ-269] N77-33986
Alternative approaches to plasma confinement
[NASA-TM-X-73793] N77-34000
On the stability of ballooning modes in the boundary layer of a gas insulated plasma
[TRITA-PFU-77-04] N77-34015

NUCLEAR MAGNETIC RESONANCE
Nuclear magnetic resonance investigation of the structure and dynamics of valine transfer ribonucleic acid [escherichia coli]
N77-33285

NUCLEAR POWER PLANTS
Public acceptance of nuclear power
[IAEA-CN-36/507] N77-33630

NUCLEAR POWER REACTORS
Subsea nuclear power generating stations for offshore oil production operations. Preliminary safety and licensing information document
[AI-ERDA-13193] N77-33637

NUCLEAR PROPULSION
An evaluation of very large airplanes and alternative fuels: Executive summary
[AD-A042112] N77-33154

NUCLEAR RADIATION
Improved nuclear gage development phase 1 and 2
[PB-267106/3] N77-33496

NUCLEAR REACTORS
Net energy from nuclear power
[IAEA-CN-36/399] N77-33676
Fusion-fission hybrid reactors: A capsule introduction
[UCID-17397] N77-34011

NUCLEIC ACIDS
Nuclear magnetic resonance investigation of the structure and dynamics of valine transfer ribonucleic acid [escherichia coli]
N77-33285

NUMERICAL ANALYSIS
An experimental investigation of shock wave-turbulent boundary layer interactions with and without boundary layer suction: A data summary report
[NASA-CR-2872] N77-33440
A numerical study of nonlinear effects on boundary-layer stability
[AD-A041088] N77-33446
The numerical calculation of steady inviscid supercritical flow past ellipsoids without circulation
[AD-A041016] N77-33453
Numerical investigation of confined turbulent shear flows
[LBL-5582] N77-33457
Recurrence relations for computing with modified divided differences
[NASA-CR-155177] N77-33911
Gaussian elimination and numerical instability
[AD-A042159] N77-33919
An algorithm for minimizing a differentiable function subject to box constraints and errors
[AD-A042916] N77-33924
An improved formulation for extending the geometrical theory of diffraction by the moment method
[AD-A041775] N77-33972

NUMERICAL CONTROL
Automated chest X-ray analysis
[LA-UR-77-532] N77-33851

NUMERICAL FLOW VISUALIZATION
Numerical treatment of arbitrarily-shaped regions in fluid dynamics
[AD-A041741] N77-33451

NUMERICAL INTEGRATION
Numerical solution of a class of random boundary value problems
N77-33909

NUMERICAL WEATHER FORECASTING
Weather forecasting and weather forecasts: Models, systems and users. Volume 2: Notes from a colloquium
[PB-268914/9] N77-33775

NUTRITION
Application of satellite remote sensing to North Carolina. Development of a monitoring methodology for trophic states of lakes in North Carolina
[NASA-CR-150419] N77-33590

NYLON [TRADEMARK]
Biodegradable polymer: Synthesis and characterization of Alpha-benzylated nylons and related polymers
N77-33343
Protection of nomex from ultraviolet degradation
[AD-A041494] N77-33358

O

OASES
Energy in an oasis: Geothermal resource development in the Imperial Valley of California
N77-33598

OCEAN CURRENTS
Investigation of environmental change pattern in Japan. Investigation of variations in the prominent oceanic current, Kuroshio
[E77-10232] N77-33563
Gulfstream: Monthly publications, January-December 1976. Volume 2, numbers 1-12
[PB-268216/9] N77-33779
Reciprocal acoustic transmission in a mid-ocean environment
N77-33955

OCEAN SURFACE
Stereophotogrammetric reconnaissance of ocean wave/sea ice interaction
N77-33552
Application of LANDSAT MSS data to the study of oceanographical environment — Seto Inland Sea
[E77-10228] N77-33559
Significant applications of LANDSAT-2 MSS data to marine environment — Japanese coastal areas
[E77-10229] N77-33560

OCEAN THERMAL ENERGY CONVERSION
Geophysical fluid dynamics background for ocean thermal power plants
[DSE/1005-1] N77-33624
Marine pastures: A by-product of large [100 megawatt or larger] floating ocean-thermal power plants
[COO-2581-3] N77-33625
Ocean Thermal Energy Conversion [OTEC] program summary
[ERDA-76-142] N77-33642
Incentives for the commercialization of Ocean Thermal Energy Conversion Technology [OTEC]
[PB-268097/3] N77-33665
Incentives for the commercialization of Ocean Thermal Energy Conversion technology [OTEC], executive summary
[PB-268096/5] N77-33666

OCEANOGRAPHIC PARAMETERS
Gulfstream: Monthly publications, January-December 1976. Volume 2, numbers 1-12
[PB-268216/9] N77-33779

OCEANOGRAPHY
Design of an electrohydraulic wave follower system
[AD-A042317] N77-33778

OCEANS
The shapes of marine magnetic anomalies: Paleomagnetic field behavior, paleomagnetic poles and ridge crest processes
N77-33716

OCTAVES
Industrial sound level meter internal noise in octave bands test
[PB-268952/9] N77-33963

OFFSHORE ENERGY SOURCES
Subsea nuclear power generating stations for offshore oil production operations. Preliminary safety and licensing information document
[AI-ERDA-13193] N77-33637

OFFSHORE REACTOR SITES
Subsea nuclear power generating stations for offshore oil production operations. Preliminary safety and licensing information document
[AI-ERDA-13193] N77-33637

OIL POLLUTION
Evaluation of Ocean Color Scanner [OCS] photographic and digital data: Santa Barbara Channel test site, 29 October 1975 overflight
[NASA-CR-155171] N77-33587
The biodegradation of oil in sea water for naval pollution control
[AD-A042375] N77-33688

OILS
The economic determinants of waste oil recycling
N77-33597
Economic impact of proposed amendment to water pollution regulations for hexane extractable materials, R74-1, 8, 9
[PB-269184/8] N77-33709

OKLAHOMA
Predicting changes in land-use patterns resulting from water resource investment using a nonstationary Markov process
[PB-269409/9] N77-33595

ON-LINE PROGRAMMING
A study of the hemin heterogeneous rate constant in non-aqueous solvents with on-line coulostatic system
N77-33275

The BIOSIS data base: Evaluation of its indexes and the STRATBLDR, CHEMFILE, STAIRS and DIALOG systems for on-line searching
[NASA-CR-2893] N77-33869
Intelligent on-line assistant and tutor system
[AD-A041727] N77-33880
ONBOARD EQUIPMENT
Lower body negative pressure device
N77-33821
Automatic blood pressure measuring system [M091]
N77-33822
Vectorcardiograph
N77-33824
A.I.e. in-flight blood collection system
N77-33825
Ergometer
N77-33826
Metabolic analyzer
N77-33827
Skylab experiment M131: Rotating little chair
N77-33830
Experiment support system
N77-33831
In-flight medical support system
N77-33832
Carbon dioxide/dewpoint monitor
N77-33833
Atmospheric analyzer, carbon monoxide monitor and toluene diisocyanate monitor
N77-33834
Skylab hardware report operational bioinstrumentation system
N77-33835
Exerciser
N77-33836
OPERATING SYSTEMS [COMPUTERS]
Skylab hardware report operational bioinstrumentation system
N77-33835
A user's guide to the System/3 data base management system [S3DBMS]
[PB-268875/2] N77-33874
OPTREG: An interactive computer program for optimization and regression
[PB-269480/0] N77-33891
OPERATORS [MATHEMATICS]
Results in semi-inner-product spaces and generalized cosine operator functions
N77-33949
OPERATORS [PERSONNEL]
Observability and identifiability of nonlinear dynamical systems with an application to the optional control model for the human operator
[AD-A041794] N77-33899
OPTICAL COMMUNICATION
State of the art in fiber optics communications and data transfer
[AD-A042579] N77-33398
OPTICAL MEASUREMENT
Self-study manual on optical radiation measurements. Part 1: Concepts, chapter 6. Distribution of optical radiation with respect to polarization
[PB-268502/2] N77-33977
OPTICAL MEASURING INSTRUMENTS
Use of miniature optical probes in two-phase gas-liquid flow
[INEL-TR-10] N77-33460
OPTICAL PROPERTIES
Optical properties of chemically sprayed CdS/Cu/sub x/S photovoltaic cells
[SAND-76-0729] N77-33656
Optical coatings 2-6 microns — thin film deposition
[AD-A041130] N77-33971
OPTICAL RADAR
The use of lidar for stratospheric measurements
[NASA-TM-74085] N77-33498
Surface detail and backscatter from coherently illuminated targets rotating about the axis of symmetry
[AD-A042349] N77-33506
Mission definition for the first flight of a multidisciplinary lidar system formulated following discussions with representatives of various institutes
[DLR-IB-553-76/4] N77-33513
Lidar detection of subvisible reentry vehicle erosive atmospheric material
[AD-A041085] N77-33724
Multidisciplinary lidar system in Spacelab for application to atmospheric physics and remote sensing — aerosols and trace gases
[ESA-TT-404] N77-33739
OPTICAL TRACKING
Effects of visual propioceptive cue conflicts on human tracking performance
[AD-A042006] N77-33860
OPTICS
Optical analysis of a multicolor model of the 360 degree nonprogrammed visual display
[AD-A042092] N77-33499
OPTIMIZATION
Turbulent effects in axial compressors
[AAAF-NT-77-20] N77-33180
A Bayesian model for determining the optimal test stress for a single test unit
[AD-A041232] N77-33530
OPTREG: An interactive computer program for optimization and regression
[PB-269480/0] N77-33891
Optimal control of birth and death processes and queues
[AD-A042123] N77-33944
ORAL HYGIENE
Skylab oral health studies
N77-33786
ORBIT CALCULATION
Calculation of reference orbits by solving selfadjoint boundary value problem
[SER-C/DISS-228] N77-33228
Development of finite element models for the earth's gravity field. Phase 1: Macrogravity model for satellite orbit integration
[AD-A038463] N77-33728
ORBITAL MECHANICS
Technology requirements for advanced earth-orbital transportation systems: Summary report — single stage to orbit vehicles
[NASA-CR-2867] N77-33255
Technology requirements for advanced earth-orbital transportation systems, dual-mode propulsion
[NASA-CR-2868] N77-33256
ORBITAL POSITION ESTIMATION
Satellite situation report, volume 17, number 4
[NASA-TM-74975] N77-33240
ORDER-DISORDER TRANSFORMATIONS
A theoretical approach to glass transition phenomena
N77-33289
ORGANIC COMPOUNDS
Structure analyses of several organic compounds using X-ray crystallographic techniques
N77-33286
ORGANIC WASTES [FUEL CONVERSION]
Reclamation of energy from solid waste: Theory and practice. A selected, annotated bibliography for Pennsylvania local government officials
[PB-267800/1] N77-33621
ORGANOMETALLIC COMPOUNDS
The understanding of molecular properties by both experimental and theoretical methods: The localized molecular orbitals of transition metal complexes, and the ionization potentials of n-alkenes
N77-33284
Pyrazinecarboxylate, isomeric pyridiniumcarboxylates and isomeric nitrobenzoates as bridging ligands in electron transfer reactions
N77-33295
Crystal structure and magnetic studies of bis[mu-dibutylphosphinato] copper [II]
[AD-A041510] N77-34020
ORION CONSTELLATION
A photometric study of the Orion OB 1 association. 3: Subgroup analyses
[NASA-TM-X-71407] N77-34062
ORTHOGONALITY
Results in semi-inner-product spaces and generalized cosine operator functions
N77-33949
ORTHOSTATIC TOLERANCE
Lower body negative pressure: Third manned Skylab mission
N77-33809
Activity of the digestive system during 49-day antiorthostatic human hypokinesia
[NASA-TM-75177] N77-33846
OSCILLATING FLOW
Turbulent effects in axial compressors
[AAAF-NT-77-20] N77-33180
OUTER PLANETS EXPLORERS
Voyager: Journey to the outer planets
[NASA-CR-155147] N77-33233
OUTPUT
A prediction model to forecast the cost impact from a break in the production schedule
[NASA-TM-78131] N77-34044
OXAMIC ACIDS
The synthesis and characterization of selected copolyoxamides with special emphasis on their complexation behavior
N77-33346
OXIDATION
Sulfur poisoning of hydrocarbon oxidation by palladium
[NASA-CR-155192] N77-33264
Role of stress effects in the oxidation behavior of high temperature alloys
[CONF-761057-4] N77-33333
OXIDATION RESISTANCE
The 100,000-hour cyclic oxidation behavior at 815C [1500 F] of 33 high-temperature alloys
[NASA-TM-73707] N77-33316
OXIDATION-REDUCTION REACTIONS
Pyrazinecarboxylate, isomeric pyridiniumcarboxylates and isomeric nitrobenzoates as bridging ligands in electron transfer reactions
N77-33295
OXYGEN
Island dissolution phase transition in a chemisorbed layer
[AD-A042444] N77-33303
Analysis of gases in metals: The dc arc gas chromatographic technique. Part 4: Simultaneous determination of H2, O2, and N2 in metals using argon as inert gas medium
[BARC-800-PT-4] N77-33307
OZONE
Photochemical studies of secondary nitramines. Part 2: Ultraviolet photolysis and ozonolysis of RDX in aqueous solutions
[AD-A042715] N77-33304
OZONOMETRY
Total ozone derived from UV spectrophotometer measurements on the NASA CV-990 aircraft for the fall 1976 latitude survey flights
[NASA-CR-135276] N77-33684

P

PACIFIC OCEAN
Investigation of environmental change pattern in Japan. Classification of shorelines — Nagoya, Yokkaichi, and Ria, Japan
[E77-10224] N77-33555
Statistical diagnostic modeling of marine fog using model output parameters
[AD-A042059] N77-33748
PALEOMAGNETISM
The paleomagnetism of the Palisade Sill and the development of the arm correction method of paleointensity determination — anhysteretic remanence
N77-33711
The shapes of marine magnetic anomalies: Paleomagnetic field behavior, paleomagnetic poles and ridge crest processes
N77-33716
PALEONTOLOGY
Search for North American microtektites in Georgia coastal plain sediments
[NASA-CR-152596] N77-33719
PALLADIUM
Sulfur poisoning of hydrocarbon oxidation by palladium
[NASA-CR-155192] N77-33264
PANELS
A research program to reduce interior noise in general aviation airplanes. Design of an acoustic panel test facility
[NASA-CR-155152] N77-33957
A research to reduce interior noise in general aviation airplanes. General aviation interior noise study
[NASA-CR-155153] N77-33958
A research program to reduce interior noise in general aviation airplanes — test methods and results
[NASA-CR-155154] N77-33959
PARABOLIC ANTENNAS
AAFE large deployable antenna development program: Executive summary
[NASA-CR-2894] N77-33260
PARABOLIC REFLECTORS
AAFE large deployable antenna development program: Executive summary
[NASA-CR-2894] N77-33260
PARACHUTE DESCENT
An analysis of personnel parachutes for use by Marine Corps Force Reconnaissance Units
[AD-A041151] N77-33124
PARACHUTES
An analysis of personnel parachutes for use by Marine Corps Force Reconnaissance Units
[AD-A041151] N77-33124
PARALLEL PROCESSING [COMPUTERS]
Vector processing in simulation
[AD-A041747] N77-33883
PARKS
Application of remote sensing technology to the solution of problems in the management of resources in Indiana
[E77-10223] N77-33554
PARTIAL DIFFERENTIAL EQUATIONS
Non-standard partial difference equations
N77-33907
An addition formula for Green's functions
[AD-A041667] N77-33913
Apriori estimates of higher order derivatives of solutions to the FitzHugh-Magumo equations
[AD-A042694] N77-33922
Error behavior of multistep methods applied to unstable differential systems
[NASA-CR-155169] N77-33941
PARTICLE COLLISIONS
Collisional dissociation and structural properties of atmospheric negative ions
[AD-A042111] N77-33730
Anomalous effect of small collisions on the nonlinear interaction in a small cold beam and a warm plasma system
[IPPJ-295] N77-34003
PARTICLE DENSITY [CONCENTRATION]
Density, compressibility, thermal conductivity, and mechanical movement of solid hydrazine
[AD-A042039] N77-33301

PARTICLE DIFFUSION
Nonlinear heat and particle transport due to collisional drift waves
[IPPJ-281] N77-33996
PARTICLE MASS
End pluggings of a linear theta pinch by hot high Z plasmas of high mass number
[IPPJ-262] N77-33979
PARTICLE SIZE DISTRIBUTION
The effect of grain size on thermal diffusion in metals
[AD-A041532] N77-33321
Particle size distribution of nitrate aerosols in the Los Angeles air basin
[PB-269349/7] N77-33703
PARTICLES
Efficiency of particle removal from viscous liquids with a hydroclone
[ORNL-MIT-237] N77-33458
Trapping and detrapping in a single wave and particle acceleration in a magnetoplasma
[IPPJ-263] N77-33980
PARTICULATE SAMPLING
Evaluation of stationary source particulate measurement methods. Volume 2: Oil-fired steam generators
[PB-269081/6] N77-33705
PATTERN RECOGNITION
A spatial frequency analysis model for predicting human performance at visual pattern matching tasks
[AD-A041649] N77-33859
Dynamic scene analysis: The study of moving images
[AD-A042124] N77-33901
PAYLOADS
Technical and economic assessment of swept-wing span-distributed load concepts for civil and military air cargo transports
[NASA-CR-145229] N77-33147
Orbiter/payload proximity operations: Lateral approach technique
[NASA-TM-74965] N77-33247
Shuttle payload vibroacoustic test plan evaluation. Free flyer payload applications and sortie payload parametric variations
[NASA-CR-152594] N77-33250
Feasibility and systems definition study for Microwave Multi-Application Payload [MMAP]
[NASA-CR-152611] N77-33251
PELLETS
Possibility of stable implosion of structured pellet, 1
[IPPJ-293] N77-34001
PENNSYLVANIA
Systems studies of energy conservation: Methane produced from coalbeds, volume 2
[MERC/CR-77/4-VOL-2] N77-33661
PERFORATED PLATES
Shock wave attenuation by perforated plates with various hole sizes
[AD-A041854] N77-33449
PERFORMANCE PREDICTION
A procedure for predicting the life of turbine engine components
N77-33192
Design considerations in mechanical face seals for improved performance. 2: Lubrication
[NASA-TM-73736] N77-33518
Ductility normalized-strainrange partitioning life relations for creep-fatigue life predictions
[NASA-TM-73737] N77-33536
DoD energy R And D. Part 2: Military fuel operations. Performance and R and D implications
[AD-A042272] N77-33617
PERFORMANCE TESTS
Multipath and performance tests of TRSB receivers
[AD-A041891] N77-33135
Air traffic control experimentation and evaluation test
[AD-A041971] N77-33136
Performance of branch circuit electrical terminations of copper and aluminum non-metallic sheathed cable
[PB-267221/0] N77-33434
PERMITTIVITY
Dielectric constants, pair interactions and molecular shape of polar molecules
N77-33293
PERSONNEL MANAGEMENT
An application of Markovian chains in manpower planning
[AD-A042304] N77-34032
PERSONNEL SELECTION
Promoting energy conservation through occupational licensure: A feasibility study
[LBL-5996] N77-33647
Psychometric characteristics of astronauts
[AD-A039228] N77-33855
PERTURBATION THEORY
Contribution of higher order terms in the reductive perturbation theory. 2: A case of strongly dispersive wave
[IPPJ-277] N77-33992
PETROGRAPHY
Electron microprobe analyses of minerals in Precambrian rocks at the Los Alamos Scientific Laboratory Geothermal Test Site, Temez Mountains, New Mexico
[LA-6695-MS] N77-33734
PHASE SHIFT
Radiative transfer in spherical shell atmospheres. 2: Asymmetric phase functions
[NASA-CR-155162] N77-33443
PHASE TRANSFORMATIONS
A theoretical approach to glass transition phenomena
N77-33289
Island dissolution phase transition in a chemisorbed layer
[AD-A042444] N77-33303
Rheoptical studies of blends of poly [styrene-b-butadiene-b-styrene] and polystyrene
[AD-A042045] N77-33362
PHENOMENOLOGY
Cosmology and the structure of scientific theory
N77-34064
PHOSPHATES
Synthesis of alkyl and aryl phosphazene high polymers
[AD-A042449] N77-33368
PHOSPHORS
Conference on Luminescence Processes in Cathode-ray Tubes and lamps
[AD-A041443] N77-33412
PHOSPHORUS COMPOUNDS
The synthesis and characterization of the poly[metal phosphinates]
[AD-A041511] N77-33357
PHOTOCHEMICAL REACTIONS
Photochemical studies of secondary nitramines. Part 2: Ultraviolet photolysis and ozonolysis of RDX in aqueous solutions
[AD-A042715] N77-33304
PHOTODISSOCIATION
Protection of nomex from ultraviolet degradation
[AD-A041494] N77-33358
PHOTOELECTRON SPECTROSCOPY
Gas phase X-ray photoelectron spectroscopy of compounds containing multiply-bonded oxygen
N77-33278
PHOTOGRAMMETRY
Stereophotogrammetric reconnaissance of ocean wave/sea ice interaction
N77-33552
PHOTOGRAPHIC PROCESSING
Survey of computer-assisted writing and editing systems
[AGARD-AG-229] N77-34041
PHOTOMAPPING
Seismotectonic, structural, volcanologic, and geomorphic study of New Zealand; indigenous forest assessment in New Zealand; mapping, land use and environmental studies in New Zealand, volume 3
[E77-10235] N77-33566
LANDSAT planning applications in east central Florida
[E77-10238] N77-33569
PHOTOMULTIPLIER TUBES
Manufacturing methods and techniques for miniature high voltage hybrid multiplier modules
[AD-A041765] N77-33423
PHOTOSPHERE
Sources of magnetic fields in recurrent interplanetary streams
[NASA-TM-X-71400] N77-34091
PHOTOSYNTHESIS
Biological solar energy conversion: Approaches to overcome yield, stability and product limitations
[PB-267937/1] N77-33619
PHOTOVOLTAIC CELLS
Proceedings of the ERDA Semiannual Solar photovoltaic Program Review Meeting
[CONF-760837-P2] N77-33628
Optical properties of chemically sprayed CdS/Cu/sub x/S photovoltaic cells
[SAND-76-0729] N77-33656
PHYSICAL EXERCISE
Skylab 4 crew observations
N77-33783
Muscular deconditioning and its prevention in space flight
N77-33801
Ergometer
N77-33826
Exerciser
N77-33836
PHYSICAL PROPERTIES
Properties of thermally contracting tantalum tungstate
[Y-2071] N77-33306
Physical properties of gasoline/methanol mixtures
[BERC/RI-76/12] N77-33375
PHYSICAL SCIENCES
Computer networks in the physical sciences
[LBL-5594] N77-33894
PHYSICAL WORK
Crew efficiency on first exposure to zero-gravity
N77-33797
PHYSIOLOGICAL EFFECTS
Skylab crew health: Crew surgeon's report
N77-33785
PHYSIOLOGICAL RESPONSES
Biomedical results from Skylab
[NASA-SP-377] N77-33780
Skylab 2 crew observations and summary
N77-33784
Skylab crew health: Crew surgeon's report
N77-33785
Skylab experiment M131: Rotating little chair
N77-33830
Response of the cardiovascular system to vibration and combined stresses
[AD-A039000] N77-33848
Recovery of middle components of human auditory averaged electroencephalic response
N77-33953
PIEZOELECTRICITY
Lead zirconate titanate [lzt] ceramics
[AD-A041507] N77-33360
PILOT PERFORMANCE
Requirements for flight testing automated terminal service
[AD-A041975] N77-33137
PILOTS [PERSONNEL]
Retention of selected physiological indicators in pilots in the course of agricultural flights
[NASA-TT-F-17441] N77-33845
PIONEER VENUS SPACECRAFT
Report of the Terrestrial Bodies Science Working Group. Volume 3: Venus
[NASA-CR-155187] N77-34076
PIPE FLOW
Heat transfer analysis for unsteady high velocity pipe flow — gun barrels
[AD-A041547] N77-33477
PIPELINES
Systems studies of energy conservation: Methane produced from coalbeds, volume 2
[MERC/CR-77/4-VOL-2] N77-33661
PIPER AIRCRAFT
Aircraft accident report. Midair collision. Reeds Aviation, Inc., Piper PA-28R-200, N7941C, and Piper-28-181, N8592C, near Huntsville, Missouri, 24 July 1976
[NTISUB/C/104-002] N77-33133
PISTONS
Static and dynamic response calculations for the new Coulport launcher piston assembly
[NCRE/N206] N77-33534
PLANETARY ENVIRONMENTS
Advanced planetary studies
[NASA-CR-155055] N77-34072
PLANETARY LANDING
Advanced planetary studies
[NASA-CR-155054] N77-34071
PLANKTON
Investigation of environmental change pattern in Japan. Utilization of LANDSAT-2 data for fisheries
[E77-10227] N77-33558
PLANTS [BOTANY]
Study of metabolism and energetics in hypogravity: Degenerative effects of prolonged hypogravity
[NASA-CR-155199] N77-33839
Higher plant metabolism and energetics in hypogravity: Amino acid metabolism in higher plants
[NASA-CR-155198] N77-33840
PLASMA CONDUCTIVITY
Problems related to macroscopic electric fields in the magnetosphere
[TRITA-EPP-77-08] N77-33736
PLASMA CONTROL
Alternative approaches to plasma confinement
[NASA-TM-X-73793] N77-34000
Revised and enlarged collection of plasma physics formulas and data
[AD-A041545] N77-34006
PLASMA DECAY
Parametric decay of lower hybrid wave into drift waves
[IPPJ-272] N77-33988
PLASMA DENSITY
Real-space quasilinear theory of drift in a sheared magnetic field
[IPPJ-279] N77-33994
On the stability of ballooning modes in the boundary layer of a gas insulated plasma
[TRITA-PFU-77-04] N77-34015
PLASMA DIFFUSION
Diffusion of a multi-ion species plasma due to drift wave fluctuations
[IPPJ-267] N77-33984
PLASMA DYNAMICS
Dynamics of a coaxial plasma gun
[TRITA-EPP-77-02] N77-34014
PLASMA FLUX MEASUREMENTS
Real-space quasilinear theory of drift in a sheared magnetic field
[IPPJ-279] N77-33994
Theory of two-fluid equilibrium of an axially symmetric plasma
[IPPJ-282] N77-33997
PLASMA GUNS
Dynamics of a coaxial plasma gun
[TRITA-EPP-77-02] N77-34014

PLASMA HEATING
Observation of current-driven ion sound wave in a turbulently heated plasma: The Mach 2
[IPPJ-274] N77-33989
Study on RF voltage breakdown for LHRH in 0.8 - 0.9 GHz
[IPPJ-J-27] N77-33998
A hollow cathode hydrogen ion source
[NASA-TM-73783] N77-33999
Particle simulation on the propagation and plasma heating of the lower hybrid wave in the nonuniform system
[IPPJ-296] N77-34004

PLASMA INTERACTIONS
Theory for space-time evolution of explosive-type instability
[IPPJ-276] N77-33991
Anomalous effect of small collisions on the nonlinear interaction in a small cold beam and a warm plasma system
[IPPJ-295] N77-34003

PLASMA JETS
Saturation of kink instability and helical equilibrium of current carrying plasma column
[IPPJ-278] N77-33993

PLASMA OSCILLATIONS
Experimental study on self-modulation of ion plasma oscillations
[IPPJ-280] N77-33995
Adiabatic oscillations of the one-dimensional SGEMP boundary layer
[AD-A041960] N77-34008

PLASMA RESONANCE
Study on RF voltage breakdown for LHRH in 0.8 - 0.9 GHz
[IPPJ-J-27] N77-33998

PLASMA SLABS
Nonlinear electrostatic ion cyclotron waves in an RF-plugged inhomogeneous plasma slab
[IPPJ-275] N77-33990
Microinstabilities in a plasma slab with steep density gradient
[IPPJ-294] N77-34002

PLASMA TURBULENCE
Observation of current-driven ion sound wave in a turbulently heated plasma: The Mach 2
[IPPJ-274] N77-33989

PLASMA WAVES
Electromagnetic plasma wave emissions from the auroral field lines
[NASA-CR-155172] N77-33387
Theory for space-time evolution of explosive-type instability
[IPPJ-276] N77-33991
Contribution of higher order terms in the reductive perturbation theory. 2: A case of strongly dispersive wave
[IPPJ-277] N77-33992
Real-space quasilinear theory of drift in a sheared magnetic field
[IPPJ-279] N77-33994
Microinstabilities in a plasma slab with steep density gradient
[IPPJ-294] N77-34002
Anomalous effect of small collisions on the nonlinear interaction in a small cold beam and a warm plasma system
[IPPJ-295] N77-34003
Particle simulation on the propagation and plasma heating of the lower hybrid wave in the nonuniform system
[IPPJ-296] N77-34004

PLASMA-ELECTROMAGNETIC INTERACTION
Diffusion of a multi-ion species plasma due to drift wave fluctuations
[IPPJ-267] N77-33984
The nonlinear distortion of propagation cones of lower hybrid wave in an inhomogeneous plasma
[IPPJ-268] N77-33985
Experimental study on self-modulation of ion plasma oscillations
[IPPJ-280] N77-33995
Microinstabilities in a plasma slab with steep density gradient
[IPPJ-294] N77-34002

PLASMA-PARTICLE INTERACTIONS
Alternative approaches to plasma confinement
[NASA-TM-X-73793] N77-34000

PLASMAS [PHYSICS]
Equilibrium of REB-ring with soft-core
[IPPJ-260] N77-33978
End pluggings of a linear theta pinch by hot high Z plasmas of high mass number
[IPPJ-262] N77-33979
Trapping and detrapping in a single wave and particle acceleration in a magnetoplasma
[IPPJ-263] N77-33980
Nonlinear propagation of the ordinary mode in a hot magnetoplasma
[IPPJ-265] N77-33982
Diffusion of a multi-ion species plasma due to drift wave fluctuations
[IPPJ-267] N77-33984
Effects of nuclear fusion on reaction on diffusion and thermal conduction in a magnetoplasma
[IPPJ-269] N77-33986
Nonlinear electrostatic ion cyclotron waves in an RF-plugged inhomogeneous plasma slab
[IPPJ-275] N77-33990
Alternative approaches to plasma confinement
[NASA-TM-X-73793] N77-34000
Revised and enlarged collection of plasma physics formulas and data
[AD-A041545] N77-34006
Formation and adiabatic compression of reversed-field theta pinches in imploding liners
[AD-A041737] N77-34007
Development of microwave plasma detoxification process for hazardous wastes, phase
[PB-268526/1] N77-34055

PLASTIC COATINGS
Abrasion resistance of safety lenses. Effects of abrasion on toughened safety glass and plastic lenses with respect to their optical properties
[PB-267399/4] N77-33367
Investigation of coating compounds and adhesives for self-supporting collapsible fuel storage tanks
[AD-A042653] N77-33369

PLASTIC PROPERTIES
On dynamic plastic mode form solutions
[AD-A042361] N77-33543

PLASTICS
Program to evaluate, develop, and test poroplastic materials as improved electrical insulation for high power underground cables
[EPRI-EL-312] N77-33433

PLATES [STRUCTURAL MEMBERS]
Direct determination of flexural strains in plates using projected gratings
[AD-A041917] N77-33537

PLATINUM COMPOUNDS
Temperature programmed exchange studies of supported metal catalysts
N77-33281

POINT SOURCES
Point source detection in infrared astronomical surveys
[NASA-CR-152004] N77-34061

POISONING
Sulfur poisoning of hydrocarbon oxidation by palladium
[NASA-CR-155192] N77-33264

POISSON DENSITY FUNCTIONS
Average delay in queues with nonstationary Poisson arrivals
[AD-A041629] N77-33932

POLAR CAPS
Martian polar geological studies
[NASA-CR-155160] N77-34069

POLAR ORBITS
Report of the Terrestrial Bodies Science Working Group. Volume 4: The moon — lunar polar orbiter mission
[NASA-CR-155186] N77-34077

POLARIMETRY
Self-study manual on optical radiation measurements. Part 1: Concepts, chapter 6. Distribution of optical radiation with respect to polarization
[PB-268502/2] N77-33977

POLARIZATION [WAVES]
Self-study manual on optical radiation measurements. Part 1: Concepts, chapter 6. Distribution of optical radiation with respect to polarization
[PB-268502/2] N77-33977
Polarization spectra of centimeter wavelength solar bursts using whole-sun observations
[AD-A038782] N77-34087

POLICIES
Review policies and their effect on journal quality
[PB-267602/1] N77-34039

POLLUTION CONTROL
Pollution reduction technology program for small jet aircraft engines, phase 1
[NASA-CR-135214] N77-33168
Lean premixed/prevaporized combustion
[NASA-CP-2016] N77-33297
The biodegradation of oil in sea water for naval pollution control
[AD-A042375] N77-33688
Bachman treatment facility for excessive storm flow in sanitary sewers
[PB-269128/5] N77-34060

POLLUTION MONITORING
A summary of the test procedures and operational details of an ocean dumping pollution monitoring experiment conducted 7 October 1976
[NASA-TM-74066] N77-33579
Coal gasification study
[AD-A041860] N77-33615
Monitoring air quality with lichen: A feasibility study
[NP-21650] N77-33689
Development of air-monitoring techniques using solid sorbents. LASL Project R-059, NIOSH-IA-77-12
[LA-6738-PR] N77-33693
Evaluation of continuous monitors for carbon monoxide in stationary sources
[PB-268861/2] N77-33708

POLYESTERS
Crystallization-induced reaction of aromatic copolyesters
N77-33340

POLYIMIDE RESINS
Biodegradable polymer: Synthesis and characterization of Alpha-benzylated nylons and related polymers
N77-33343
Synthesis of polyimides curable by intramolecular cycloaddition
[AD-A041420] N77-33355

POLYMER CHEMISTRY
Electronic structure of biopolymers
N77-33336
Synthesis of 1,9,10-anthyridines and annelation fo 1,8-naphthyridine units via Friedlander condensation
N77-33341
Small-angle X-ray and small-angle light scattering studies of the morphology of polymer blends
N77-33342
Biodegradable polymer: Synthesis and characterization of Alpha-benzylated nylons and related polymers
N77-33343
The surface chemistry of acrylic polymer colloids
N77-33345
The synthesis and characterization of selected copolyoxamides with special emphasis on their complexation behavior
N77-33346
The synthesis and characterization of the poly[metal phosphinates]
[AD-A041511] N77-33357

POLYMER PHYSICS
Statistics of chain molecules between two adsorbing surfaces
N77-33277

POLYMERIZATION
Polymerization of methyl methacrylate initiated by t-butyl hydroperoxide in the presence of metal acetylacetonates
N77-33338
Synthesis of 1,9,10-anthyridines and annelation fo 1,8-naphthyridine units via Friedlander condensation
N77-33341
Directional solidification of polymers in a temperature gradient
N77-33344

POLYMERS
Polymer-solvent interactions and diffusion in constrained elastomers
N77-33337
Synthesis of alkyl and aryl phosphazene high polymers
[AD-A042449] N77-33368
Solid polymer electrolyte [SPE] fuel cell technology program, phase i/1A — design and fabrication
[NASA-CR-151506] N77-33605
Solid polymer electrolyte [SPE] fuel cell technology program, phase 2/2A — testing and evaluations
[NASA-CR-151507] N77-33606

POLYNOMIALS
Recurrence relations for computing with modified divided differences
[NASA-CR-155177] N77-33911
Collection of equations for low-degree least-squares polynomials
[SAND-76-0648] N77-33927

POLYSTYRENE
Viscoelastic properties of homogeneous block copolymers
[AD-A042044] N77-33361
Rheoptical studies of blends of poly [styrene-b-butadiene-b-styrene] and polystyrene
[AD-A042045] N77-33362

POLYVINYL CHLORIDE
Small-angle X-ray and small-angle light scattering studies of the morphology of polymer blends
N77-33342

POPULATIONS
Analytical approach to the determination of urban population density gradients and its application to energy planning problems
[BNL-20916] N77-34054

POROUS MATERIALS
Program to evaluate, develop, and test poroplastic materials as improved electrical insulation for high power underground cables
[EPRI-EL-312] N77-33433
FLOW 22: Users's description — for 2D two phase incompressible fluid flow through porous medium
[STF71-A75003] N77-33462
Immiscible flow by finite elements
[STF71-A76017] N77-33466

POSITION INDICATORS
Geometrical problems with a position sensitive detector employed on a diffractometer: Its use in the measurement of stress
[AD-A041102] N77-33484

POSITIONING DEVICES [MACHINERY]
Design of an electrohydraulic wave follower system
[AD-A042317] N77-33778

POSTURE
The effects of prolonged exposure to weightlessness on postural equilibrium
N77-33792

POTENTIAL ENERGY
Lattice dynamics and intermolecular potentials for hydrocarbons
N77-34017

POTENTIAL FLOW
Improved computer programs for calculating potential flow in propulsion system inlets
[NASA-TM-73728] N77-33164
POTENTIAL GRADIENTS
Unsteady supersonic aerodynamic theory for interfering surfaces by the method of potential gradient
[NASA-CR-2898] N77-33121
POWDER [PARTICLES]
Relations among Kubelka-Munk coefficients and absorption and scattering coefficients of powders
[AD-A041110] N77-33300
POWDER METALLURGY
Powder processing of trip steel
[AD-A041069] N77-33318
POWER AMPLIFIERS
Millimeter wave gyrotron development, phase I
[AD-A041596] N77-33415
POWER LIMITERS
Development of current limiter using vacuum arc current commutation. Phase 1: A feasibility study for using arc instability in vacuum for current limitation
[EPRI-EL-393] N77-33427
POWER LINES
Study of underground power cable installation methods
[EPRI-EL-374] N77-33432
PRECAMBRIAN PERIOD
Electron microprobe analyses of minerals in Precambrian rocks at the Los Alamos Scientific Laboratory Geothermal Test Site, Temez Mountains, New Mexico
[LA-6695-MS] N77-33734
PRECIPITATION [CHEMISTRY]
Efficiency of particle removal from viscous liquids with a hydroclone
[ORNL-MIT-237] N77-33458
PRECIPITATION [METEOROLOGY]
Solar activity and a global survey of precipitation
N77-33743
A comparison of the frequency distribution of four-hour totals of manually digitized radar data with flooding over a portion of the Southeastern United States
[PB-268872/9] N77-33760
Raindrop size distributions and Z-R relationships measured on the NOAA DC-6 and the ship Researcher within the GATE B-scale array
[PB-269659/9] N77-33769
US national processing center for GATE: B-scale precipitation data
[PB-270222/3] N77-33770
Weather forecasting and weather forecasts: Models, systems and users. Volume 2: Notes from a colloquium
[PB-268914/9] N77-33775
PREDICTION ANALYSIS TECHNIQUES
Numerical investigation of confined turbulent shear flows
[LBL-5582] N77-33457
Prediction of onset and development of boundary layer transition
[AAAF-NT-77-03] N77-33470
Physical vulnerability of aircraft due to fluid dynamic effects
[AGARD-AR-106] N77-33478
A Bayesian model for determining the optimal test stress for a single test unit
[AD-A041232] N77-33530
The stochastic formulation of a modified cobweb model
[AD-A042737] N77-34046
PREMIXED FLAMES
Lean premixed/prevaporized combustion
[NASA-CP-2016] N77-33297
PRESIDENTIAL REPORTS
The President's energy program
[GPO-88-556] N77-33599
PRESSURE DISTRIBUTION
Pressure distributions on a 1- by 3-meter semispan wing with a nonstreamwise tip in subsonic flow
[NASA-TM-72755] N77-33103
PFLASH: A program to calculate Fourier cosine coefficients for pressure distributions
[SAND-76-0280] N77-33456
Exploratory study of turbulence in air intakes
[AAAF-NT-77-17] N77-33471
PRESSURE GRADIENTS
Structure of a turbulent boundary layer in longitudinal equilibrium in a positive pressure gradient
[AAAF-NT-77-18] N77-33474
PRESSURE MEASUREMENTS
A magnetic fluid seal for measurement of aerodynamic surface pressure
[AD-A040345] N77-33352
PRESSURE SENSORS
Development of a high temperature capacitive pressure transducer
[NASA-CR-135282] N77-33483
PRESSURE VESSEL DESIGN
Recent advances in lightweight, filament-wound composite pressure vessel technology
[NASA-TM-73699] N77-33265
PRESSURE VESSELS
Recent advances in lightweight, filament-wound composite pressure vessel technology
[NASA-TM-73699] N77-33265
PRESSURIZED CABINS
A research to reduce interior noise in general aviation airplanes. General aviation interior noise study
[NASA-CR-155153] N77-33958
PRIMARY BATTERIES
Sealed primary lithium-inorganic electrolyte cell
[AD-A036172] N77-33611
PRINTING
Survey of computer-assisted writing and editing systems
[AGARD-AG-229] N77-34041
PROBABILITY DISTRIBUTION FUNCTIONS
Detecting the shift in the probability of success in a series of Bernoulli trails
[AD-A042739] N77-33940
PROBLEM SOLVING
Apriori estimates of higher order derivatives of solutions to the FitzHugh-Magumo equations
[AD-A042694] N77-33922
A review of knowledge based problem solving as a basis for a genetics experiment designing system
[AD-A042720] N77-33946
PROCEEDINGS
Proceedings of the ERDA Semiannual Solar photovoltaic Program Review Meeting
[CONF-760837-P2] N77-33628
PROCUREMENT MANAGEMENT
Standard spacecraft economic analysis. Volume 2: Findings and conclusions
[NASA-CR-152539] N77-33225
PRODUCT DEVELOPMENT
Fundamental considerations for future solid lubricants
[NASA-TM-X-52659] N77-33351
PRODUCTION ENGINEERING
Investigation of test methods, material properties and processes for solar cell encapsulants
[NASA-CR-155158] N77-33347
Manufacturing methods and technology [MMTE] measure for fabrication of low voltage start sealed beam arc lamps
[AD-A041517] N77-33414
Use of a microprocessor-based interactive system to increase production of printed wiring board artwork
[SAND-77-8503] N77-33431
Development of a high temperature capacitive pressure transducer
[NASA-CR-135282] N77-33483
Transparent materials processing system
[NASA-CR-150411] N77-33516
PRODUCTION MANAGEMENT
Product improvement program evaluation
[AD-A042134] N77-33101
A prediction model to forecast the cost impact from a break in the production schedule
[NASA-TM-78131] N77-34044
PRODUCTION PLANNING
A prediction model to forecast the cost impact from a break in the production schedule
[NASA-TM-78131] N77-34044
PROGRAMMING LANGUAGES
Informality in program specifications
[AD-A041669] N77-33879
Bootstrapping a small translator writing system
[AD-A041632] N77-33882
First study of job control languages
[PU1R3/76] N77-33889
An overview of OWL, a language for knowledge representation
[AD-A041372] N77-33892
PROJECT MANAGEMENT
Interagency energy/environment research and development program: Status report 3
[PB-267443/0] N77-33662
PROJECT PLANNING
New model framework and structure and the commonality evaluation model — concerning unmanned spacecraft projects
[NASA-CR-155157] N77-33249
Ocean Thermal Energy Conversion [OTEC] program summary
[ERDA-76-142] N77-33642
Program plan for ERDA's participation in the IEA working party on energy conservation research and development
[ERDA-77-57] N77-33648
Planning and design of additional East Mesa Geothermal Test Facilities. Phase 1B, Volume 2: Procurement package
[SAN/1140-1/2-VOL-2] N77-33657
SKETCHMOD: A policy-oriented modeling process for air quality management
N77-33682
PROJECTILES
Investigation of local damage and impulse delivered to turbine blades by normal and oblique projectile impacts
[AD-A041780] N77-33178
PROPAGATION [EXTENSION]
Considerations on air pollution propagation from aircraft
[DLR-IB-553-75/6] N77-33698
PROPAGATION MODES
Modal decomposition and equivalent circuit representations of lossless coupled multiwire lines
N77-33404
Modal decomposition and equivalent circuit representations of lossy coupled multiwire lines
N77-33405
A new analysis of n-way hybrid power dividers with arbitrary power splitting ratios
N77-33407
PROPELLANT TESTS
Propellant surveillance report LGM-30 F and G stage. Phase E: Series 3, TP-H1011
[AD-A041671] N77-33373
PROPRIOCEPTION
Effects of visual propioceptive cue conflicts on human tracking performance
[AD-A042006] N77-33860
PROPULSION
Wind tunnel and analytical investigation of over-the-wing propulsion/air frame interferences for a short-haul aircraft at Mach numbers from 0.6 to 0.78 -- conducted in the Lewis 8 by 6 foot tunnel
[NASA-CR-2905] N77-33114
PROPULSION SYSTEM CONFIGURATIONS
Technology requirements for advanced earth-orbital transportation systems, dual-mode propulsion
[NASA-CR-2868] N77-33256
PROPULSION SYSTEM PERFORMANCE
Improved computer programs for calculating potential flow in propulsion system inlets
[NASA-TM-73728] N77-33164
The evolution and control of different performance degradation processes in modern propulsion systems -- monitoring jet engines
N77-33193
Methods of improving the performance reliability of advanced military power plant systems
N77-33198
PROPULSIVE EFFICIENCY
Maintenance methods for improving propulsion system reliability
N77-33184
Risks affecting the structural resistance and integrity of modern propulsion systems
N77-33187
PROPYLENE
Raman scattering studies of chain orientation in hydrostatically extruded polypropylene
[AD-A041096] N77-33356
PROTECTIVE COATINGS
Progress in advanced high temperature turbine materials, coatings, and technology
[NASA-TM-X-73628] N77-33159
PROTEINS
Scattering of rotational state selected C sF molecules by low energy electrons, 1. Determination of the surface disulfide bridge in proteins by pulse radiolysis, 2
N77-33290
Energy and protein production from pulp mill wastes
[COO-2983-2] N77-33645
PROTON DENSITY [CONCENTRATION]
Interplanetary medium data book, appendix
[NASA-TM-X-72615] N77-34066
PROVING
The software design and verification system [SDVS]
[AD-A042126] N77-33884
PSYCHOPHYSIOLOGY
The effect of psychophysical method on the loudness of continuous and interrupted pure tones
N77-33954
PUBLIC RELATIONS
Public participation in energy related decision making, edited transcripts
[PB-268781/2] N77-33674
PULMONARY FUNCTIONS
Pulmonary function evaluation during and following Skylab space flights
N77-33817
PULSE COMPRESSION
The present technology of impulse radars
[AD-A042094] N77-33394
PULSE RADAR
The present technology of impulse radars
[AD-A042094] N77-33394
PURIFICATION
Purification, controlled doping and crystal growth of II-VI compound semiconductors
[AD-A041753] N77-34025
PYRAZINES
Pyrazinecarboxylate, isomeric pyridiniumcarboxylates and isomeric nitrobenzoates as bridging ligands in electron transfer reactions
N77-33295

PYRIDINES
Pyrazinecarboxylate, isomeric pyridiniumcarboxylates and isomeric nitrobenzoates as bridging ligands in electron transfer reactions
N77-33295

Q

QUALITATIVE ANALYSIS
A safety, quality and cost effectiveness study of composition A3 press loading parameters,2
[AD-A041078] N77-33383
QUALITY CONTROL
Evaluation of continuous monitoring sites in EPA Region 6
[PB-269223/4] N77-33701
Review policies and their effect on journal quality
[PB-267602/1] N77-34039
QUANTITATIVE ANALYSIS
Cement content of fresh concrete
[PB-266931/5] N77-33549
QUANTUM MECHANICS
Investigations on approximate quantum mechanical wave functions for first period atoms and molecules
N77-33964
Study of rate of nonequilibrium decomposition of energetic molecules
[AD-A040162] N77-33965
QUATERNARY ALLOYS
Mossbauer effect studies in iron containing nonmagnetic impurities
[NASA-TM-74067] N77-34018
QUEUEING THEORY
Average delay in queues with nonstationary Poisson arrivals
[AD-A041629] N77-33932
A heterogeneous arrival and service queueing loss model
[AD-A041883] N77-33942
Markovian queueing systems with stochastically varying arrival rates
[AD-A041969] N77-33943
Optimal control of birth and death processes and queues
[AD-A042123] N77-33944
Passage time distribution for a class of queueing networks: closed, open, or mixed, with different classes of customers with applications to computer system modeling
[AD-A042723] N77-33945

R

RADAR DETECTION
Analysis of radar detection of agitated metals [RADAM]
[AD-A041713] N77-33397
RADAR SCATTERING
Scatterometer receiver dynamic range/linearity
[NASA-CR-151526] N77-33481
RADAR SIGNATURES
Analysis of radar detection of agitated metals [RADAM]
[AD-A041713] N77-33397
RADAR TARGETS
Surface detail and backscatter from coherently illuminated targets rotating about the axis of symmetry
[AD-A042349] N77-33506
RADIATION DAMAGE
Displacement cross sections and PKA spectra: Tables and applications
[HEDL-TME-76-70] N77-33332
ATS-6 solar cell experiment/improvement
[NASA-CR-152609] N77-33607
RADIATION DOSAGE
Radiological protection and medical dosimetry for the Skylab crewmen
N77-33789
RADIATION EFFECTS
Biologic effects of electric and magnetic fields associated with proposed project Seafarer
[AD-A042515] N77-33399
The effects of fast and thermal neutron flux and gamma radiation on the transmission characteristics of optical fibers
[AD-A042429] N77-33975
RADIATION SHIELDING
Radiological protection and medical dosimetry for the Skylab crewmen
N77-33789
RADIATIVE TRANSFER
Radiative transfer in spherical shell atmospheres. 2: Asymmetric phase functions
[NASA-CR-155162] N77-33443
RADICALS
Low temperature fluorine chemistry of electronegative elements
[AD-A041439] N77-33298
RADIO ALTIMETERS
Investigation of the applications of GEOS-3 radar altimeter data in remote sensing of land and sea features
[NASA-CR-141428] N77-33577
RADIO ANTENNAS
Millimeter-wave antenna design
[NASA-CR-152608] N77-33409
RADIO ASTRONOMY
Recognition of compact astrophysical objects
[NASA-SP-421] N77-34063
RADIO FREQUENCY DISCHARGE
Study on RF voltage breakdown for LHRH in 0.8 - 0.9 GHz
[IPPJ-J-27] N77-33998
RADIO FREQUENCY HEATING
Nonlinear electrostatic ion cyclotron waves in an RF-plugged inhomogeneous plasma slab
[IPPJ-275] N77-33990
Study on RF voltage breakdown for LHRH in 0.8 - 0.9 GHz
[IPPJ-J-27] N77-33998
RADIO FREQUENCY INTERFERENCE
Measurements of the influence of static and dynamic interference on an ILS-receiver and measurement of the capture effect with the double frequency procedure
[TUBS/SFB58/50] N77-33140
RADIO SOURCES [ASTRONOMY]
Stereoscopic direction finding analysis of a type III solar radio burst: Evidence for emission at twice the plasma frequency
[NASA-CR-155176] N77-34083
RADIOACTIVE MATERIALS
Compilation of documented computer codes applicable to environmental assessment of radioactivity releases
[ORNL-TM-5830] N77-33691
RADIOLYSIS
Scattering of rotational state selected C sF molecules by low energy electrons, 1. Determination of the surface disulfide bridge in proteins by pulse radiolysis, 2
N77-33290
RADIOMETERS
Sensor performance report, volume 4 [S-190A]
[NASA-CR-151528] N77-33581
RAIN
An examination of probability of precipitation forecasts in light of rainfall areal coverage
[PB-268761/4] N77-33758
Greatest known areal storm rainfall depths for the contiguous United States
[PB-268871/1] N77-33759
Computer software for the assessment of growth histories of weather radar echoes
[PB-268753/1] N77-33764
RAINDROPS
Raindrop size distributions and Z-R relationships measured on the NOAA DC-6 and the ship Researcher within the GATE B-scale array
[PB-269659/9] N77-33769
RAMAN SPECTRA
Raman spectra of molecules with anharmonic vibrations in the gaseous and solid phases
N77-33287
Raman scattering studies of chain orientation in hydrostatically extruded polypropylene
[AD-A041096] N77-33356
Stimulated raman scattering in methane with Nd YAG pump
[AD-A042391] N77-33507
RANDOM ACCESS MEMORY
Performance analysis of computer communication networks via random access channels
[AD-A041982] N77-33893
RANDOM PROCESSES
A qualitative assessment of a random process proposed as an atmospheric turbulence model
[NASA-CR-145247] N77-33145
RANDOM VARIABLES
Numerical solution of a class of random boundary value problems
N77-33909
On measures of dependence: A survey of recent developments
[AD-A041814] N77-33915
A characterization of convoluted geometric distributions
[AD-A042136] N77-33931
RANGE AND RANGE RATE TRACKING
STDN ranging equipment
[NASA-CR-152603] N77-33257
RANGELANDS
Application of remote sensing in South Dakota to provide accurate inventories of agricultural crops, enhance contrast in photographic products, monitor rangeland habitat loss, map Aspen, and prepare hydrogeologic surveys
[E77-10237] N77-33568
RARE EARTH ALLOYS
Hydrogen solubility in rare earth intermetallic compounds
N77-33288
RDX
Photochemical studies of secondary nitramines. Part 2: Ultraviolet photolysis and ozonolysis of RDX in aqueous solutions
[AD-A042715] N77-33304
REACTION KINETICS
Gas phase reactions of OH radicals studied by molecular resonance fluorescence
N77-33283
A shock tube study of the H2/02/CO/AR and H2/N2O/CO/Ar systems
[AD-A041340] N77-33299
The corrosion kinetics of copper in aqueous amino acid and carboxylic acid solutions
N77-33312
Reactions and electrochemical kinetics of newly-generated metal surfaces
[AD-A036570] N77-33317
Cathodic kinetics during corrosion of 5456-H117 aluminum alloy by high velocity sea water
[AD-A041218] N77-33320
Cathodic kinetics during corrosion of 5456-H117 aluminum alloy by high velocity sea water
[AD-A041724] N77-33324
Study of rate of nonequilibrium decomposition of energetic molecules
[AD-A040162] N77-33965
REACTOR DESIGN
Second workshop on conceptual design studies of Experimental Power Reactor-1
[ERDA-77-36] N77-34009
REACTOR MATERIALS
Intergranular stress corrosion cracking of sensitized stainless steels
[BNL-NUREG-50596] N77-33328
Mirror reactor surface study
[UCID-17168] N77-34012
REACTOR PHYSICS
Physics studies for TFTR
[TID-27494] N77-34010
REACTOR SAFETY
Public acceptance of nuclear power
[IAEA-CN-36/507] N77-33630
Subsea nuclear power generating stations for offshore oil production operations. Preliminary safety and licensing information document
[AI-ERDA-13193] N77-33637
REACTOR TECHNOLOGY
Technical and economic studies of small reactors for supply of electricity and steam
[IAEA-CN-36/398] N77-33678
Fusion-fission hybrid reactors: A capsule introduction
[UCID-17397] N77-34011
REAL TIME OPERATION
An interface unit to link a real-time analyzer with an incremental recorder [field operation and service manual]
[AD-A042130] N77-33487
RECYCLING
The economic determinants of waste oil recycling
N77-33597
RED TIDE
Investigation of environmental change pattern in Japan. Utilization of LANDSAT-2 data for fisheries
[E77-10227] N77-33558
Application of LANDSAT MSS data to the study of oceanographical environment --- Seto Inland Sea
[E77-10228] N77-33559
Significant applications of LANDSAT-2 MSS data to marine environment --- Japanese coastal areas
[E77-10229] N77-33560
REENTRY VEHICLES
General slender cone simulation at reentry flow conditions
[AD-A041063] N77-33227
REFLECTANCE
Application of remote sensing in South Dakota to provide accurate inventories of agricultural crops, enhance contrast in photographic products, monitor rangeland habitat loss, map Aspen, and prepare hydrogeologic surveys
[E77-10237] N77-33568
REFLECTION
Development of intercalated graphite materials
[AD-A041214] N77-33270
Investigation of inside light reflection problem on the Flat Plate Canopy [FPC] for model 209 AH-IS helicopter
[AD-A041332] N77-33858
REFLEXES
Changes in the Achilles tendon reflexes following Skylab missions
N77-33795
REFRACTORY MATERIALS
Progress in advanced high temperature turbine materials, coatings, and technology
[NASA-TM-X-73628] N77-33159
REFUELING
Reliability study of vapor recovery systems at service stations
[PB-267613/8] N77-33700

REGIONAL PLANNING
LANDSAT planning applications in east central Florida
[E77-10238] N77-33569
Predicting changes in land-use patterns resulting from water resource investment using a nonstationary Markov process
[PB-269409/9] N77-33595
Reflections of regional environmental systems
[ORNL-RUS-26] N77-33695
Methods used to estimate air pollutant emissions 1974, 1980, and 2000. New Jersey, New York: Connecticut air quality control region
[PB-269667/2] N77-33706

REGRESSION ANALYSIS
OPTREG: An interactive computer program for optimization and regression
[PB-269480/7] N77-33891
Measuring non-stationarity in the parameters of a linear model with applications to asset returns
[AD-A042137] N77-33938

REGULATIONS
State environmental issues series. Energy conservation. Policy considerations for the states
[PB-267857/1] N77-33663
Report of the Advisory Commission on Electric Power Alternatives
[PB-268479/3] N77-33668
Building energy conservation programs: A preliminary examination of regulatory activities at the state level
[PB-268873/7] N77-33673
Economic impact of proposed amendment to water pollution regulations for hexane extractable materials, R74-1, 8, 9
[PB-269184/8] N77-33709

REINFORCEMENT [STRUCTURES]
Corrosion behavior of steel fibrous concrete
[AD-A041339] N77-33538

REINFORCING FIBERS
Advanced composites: Electromagnetic properties, vulnerabilities, and protective measures
[AD-A042043] N77-33272
Strength of steel fiber concrete in adverse environments
[AD-A041380] N77-33539
A Weibull characterization for tensile fracture of multicomponent brittle fibers
[NASA-TM-73790] N77-33929

RELATIVISTIC THEORY
Special relativity and the conventionality of simultaneity
N77-34027
Research study on dynamics of the solar atmosphere
[AD-A035939] N77-34088

RELIABILITY
Fundamental considerations for future solid lubricants
[NASA-TM-X-52659] N77-33351
Design considerations in mechanical face seals for improved performance. 2: Lubrication
[NASA-TM-73736] N77-33518
Writing reliable programs
[PU1R4/75] N77-33888

RELIABILITY ANALYSIS
Accelerated mission test. A vital reliability tool
N77-33196
An investigation of programming practices in selected Air Force projects
[AD-A041678] N77-33885
Symbolic testing: Design techniques, costs and effectiveness
[PB-268517/0] N77-33890
Performance analysis of computer communication networks via random access channels
[AD-A041982] N77-33893

RELIABILITY ENGINEERING
Development of low cost, high reliability sealing techniques for hybrid microcircuit packages, phase 2
[NASA-CR-150420] N77-33349

RELIEF MAPS
Seismotectonic, structural, volcanologic, and geomorphic study of New Zealand; indigenous forest assessment in New Zealand; mapping, land use and environmental studies in New Zealand, volume 3
[E77-10235] N77-33566

REMANENCE
The paleomagnetism of the Palisade Sill and the development of the arm correction method of paleointensity determination --- anhysteretic remanence
N77-33711

REMOTE SENSORS
Literature review of the remote sensing of natural resources --- bibliography
[NASA-CR-155190] N77-33551
Investigation of the applications of GEOS-3 radar altimeter data in remote sensing of land and sea features
[NASA-CR-141428] N77-33577
A summary of the test procedures and operational details of an ocean dumping pollution monitoring experiment conducted 7 October 1976
[NASA-TM-74066] N77-33579
The Role of Aerospace Technology in Agriculture. The 1977 Summer Faculty Fellowship Program in Engineering Systems Design
[NASA-CR-145218] N77-33580
S-191 sensor performance evaluation
[NASA-CR-151527] N77-33582
Space studies of earth resources: Methods and means of measurements and processing of information
[NASA-TT-F-17544] N77-33583
A cost benefit evaluation of the LANDSAT follow-on program
[NASA-CR-155156] N77-33584
A study of selected environmental quality remote sensors for free flyer missions launched from the space shuttle
[NASA-CR-145252] N77-33585
Application of remote sensing for planning purposes
[NASA-CR-150418] N77-33589
Application of satellite remote sensing to North Carolina. Development of a monitoring methodology for trophic states of lakes in North Carolina
[NASA-CR-150419] N77-33590
Geology orbiter comparison study
[NASA-CR-155056] N77-34073

RESEARCH
Significance of environmental research tasks at the German Aviation and Space Research Institute
[DLR-IB-553-75/5] N77-33697

RESEARCH AND DEVELOPMENT
Perceived environmental uncertainty and the two-step flow process of scientific and technical communication in research and development laboratories
N77-34037
Research study on dynamics of the solar atmosphere
[AD-A035939] N77-34088

RESEARCH FACILITIES
Inspection of Federal facilities for compliance with noise abatement standards
[PB-269298/6] N77-33704

RESEARCH MANAGEMENT
Industrial Productivity Workshop Executive Summary
[PB-267299/6] N77-34031

RESERVES
An economic model of new crude oil and natural gas supplies in the lower 48 states
N77-33596
Energy policy decisionmaking, organization, and national energy goals
[PB-269299/4] N77-33671

RESERVOIRS
WFLOOD: Users's description. A simulation model for oil reservoirs subjected to waterflooding --- based on finite element method
[STF71-A76005] N77-33465
Application of remote sensing technology to the solution of problems in the management of resources in Indiana
[E77-10223] N77-33554
Application of remote sensing in South Dakota to provide accurate inventories of agricultural crops, enhance contrast in photographic products, monitor rangeland habitat loss, map Aspen, and prepare hydrogeologic surveys
[E77-10237] N77-33568

RESIDENTIAL AREAS
Airplane noise: Dimensions and means of noise reduction --- in Norway
[ELAB-STF44-A75080] N77-33696

RESIDUAL STRESS
A portable residual stress analyzer
[AD-A041831] N77-33542

RESIDUES
Hydrogen production from coal liquefaction residues
[EPRI-AF-233] N77-33374

RESISTORS
The effects of substrate composition on thick film circuit reliability
[AD-A041572] N77-33416

RESONANT FREQUENCIES
Study on RF voltage breakdown for LHRH in 0.8 - 0.9 GHz
[IPPJ-J-27] N77-33998

RESOURCES MANAGEMENT
Application of remote sensing technology to the solution of problems in the management of resources in Indiana
[E77-10223] N77-33554

RESPIROMETERS
Metabolic analyzer
N77-33827

REUSABLE LAUNCH VEHICLES
Technology requirements for advanced earth-orbital transportation systems: Summary report --- single stage to orbit vehicles
[NASA-CR-2867] N77-33255

REVIEWING
Overview and review of motor gasoline desulfurization, volume 1
[BERC/RI-76/17-VOL-1] N77-33377

REYNOLDS NUMBER
A survey of transition research at AEDC
[AD-A041740] N77-33219

RHEOLOGY
Rheoptical studies of blends of poly [styrene-b-butadiene-b-styrene] and polystyrene
[AD-A042045] N77-33362
From Soup to Nuts: The 7th International Congress on Rheology
[AD-A041227] N77-33445

RIBONUCLEIC ACIDS
Nuclear magnetic resonance investigation of the structure and dynamics of valine transfer ribonucleic acid [escherichia coli]
N77-33285

RIDING QUALITY
The development of a model for predicting passenger acceptance of short-haul air transportation systems
[NASA-CR-145250] N77-33148
Design and development of a structural mode control system
[NASA-CR-143846] N77-33201

RINGS [MATHEMATICS]
Periodic rings
N77-33947
Arithmetical semigroup rings
N77-33948

RISK
Practical use of decision theory to assess uncertainties about actions affecting the environment
[PB-269011/3] N77-33702

RIVERS
Significant applications of LANDSAT-2 MSS data to marine environment --- Japanese coastal areas
[E77-10229] N77-33560
Investigation of environmental change pattern in Japan. Investigation of variations in the prominent oceanic current, Kuroshio
[E77-10232] N77-33563
Applied Remote Sensing Program [ARSP] --- Apache, Yavapai, Graham, and Yuma countries, Arizona
[E77-10240] N77-33571

ROCKET EXHAUST
Rocket radiation handbook. Volume 1: Rocket radiation phenomenology and theory
[AD-A042640] N77-33263

ROCKET PROPELLANTS
Propellant management report for the Titan Centaur TC-5 extended mission
[NASA-TM-73749] N77-33232
A shock tube study of the H2/02/CO/AR and H2/N2O/CO/Ar systems
[AD-A041340] N77-33299

ROCKS
Electron microprobe analyses of minerals in Precambrian rocks at the Los Alamos Scientific Laboratory Geothermal Test Site, Temez Mountains, New Mexico
[LA-6695-MS] N77-33734

ROCKY MOUNTAINS [NORTH AMERICA]
A numerical study of the diurnal variation of the low-level jet
[PB-269484/2] N77-33772

ROLLER BEARINGS
Lubrication of high-speed, large bore tapered roller bearings
[NASA-TM-X-73673] N77-33517

ROTARY WING AIRCRAFT
Rotorcraft flight simulation with coupled rotor aeroelastic stability analysis. Volume 1: Engineer's manual
[AD-A042462] N77-33207

ROTARY WINGS
Nonlinear aeroelastic equations for combined flapwise bending, chordwise bending, torsion, and extension of twisted nonuniform rotor blades in forward flight
[NASA-TM-74059] N77-33107

ROTATING BODIES
Nonlinear formulation of finite element by corotational coordinates
[ANL-CT-77-9] N77-33548
Skylab experiment M131: Rotating little chair
N77-33830

ROTATING DISKS
Simultaneous reactions on a rotating-disk electrode
[LBL-6094] N77-33305

ROTOR AERODYNAMICS
Nonlinear aeroelastic equations for combined flapwise bending, chordwise bending, torsion, and extension of twisted nonuniform rotor blades in forward flight
[NASA-TM-74059] N77-33107

ROTOR BLADES [TURBOMACHINERY]
Study of noise and inflow distortion sources in the NASA QF-1B fan using measured blade and vane pressures
[NASA-CR-2899] N77-33113

ROTORS
Steady-state unbalance response of a three-disk flexible rotor on flexible, damped supports
[NASA-TM-X-73666] N77-33160
Optimization and characteristics of a Sailwing windmill rotor
[NSF/RANN/GI-41891/FR/75/4] N77-33652

ROVING VEHICLES
Computer visual systems for exploratory research
N77-33895
RUNWAY LIGHTS
Evaluation of revised approach lighting criteria
[AD-A038442] N77-33218
RURAL LAND USE
Applied Remote Sensing Program [ARSP] — Apache, Yavapai, Graham, and Yuma countries, Arizona
[E77-10240] N77-33571

S

SAFETY
Guidebook on anthropomorphic test dummy usage
[PB-268904/0] N77-33865
SAFETY FACTORS
Abrasion resistance of safety lenses. Effects of abrasion on toughened safety glass and plastic lenses with respect to their optical properties
[PB-267399/4] N77-33367
SAFETY MANAGEMENT
Evaluation methodology for federal motor vehicle safety standards. Volume 1: Executive summary
[PB-266936/4] N77-33381
Evaluation methodology for federal motor vehicle safety standards. Volume 2: Technical findings
[PB-266937/2] N77-33382
A safety, quality and cost effectiveness study of composition A3 press loading parameters,2
[AD-A041078] N77-33383
Safety information system guide
[ERDA-76-45/9] N77-33384
SAMPLING
A.I.e. in-flight blood collection system
N77-33825
SAN ANDREAS FAULT
An analysis of earthquake frequency data
[AD-A035813] N77-33722
SANDS
Investigation of environmental change pattern in Japan. Classification of shorelines — Nagoya, Yokkaichi, and Ria, Japan
[E77-10224] N77-33555
SAPPHIRE
Mullite phase equilibria in the system: CaO-Al2O3-SiO2
[LBL-5706] N77-33329
SATELLITE GROUND SUPPORT
Earth station design at 12/14 GHz
[NASA-CR-152597] N77-33234
SATELLITE INSTRUMENTS
Calibration results for the GEOS-3 altimeter
[NASA-CR-141430] N77-33261
SATELLITE OBSERVATION
Literature review of the remote sensing of natural resources — bibliography
[NASA-CR-155190] N77-33551
Space studies of earth resources: Methods and means of measurements and processing of information
[NASA-TT-F-17544] N77-33583
Electric field topology near the dayside magnetopause
[TRITA-EPP-77-12] N77-33737
SATELLITE SOLAR ENERGY CONVERSION
Ionosphere/microwave beam interaction study — satellite solar energy conversion
[NASA-CR-151517] N77-33389
SATELLITE TELEVISION
The implications in satellite television for social and political change in the third world
N77-33231
SATELLITE TRANSMISSION
Earth station design at 12/14 GHz
[NASA-CR-152597] N77-33234
SATELLITE-TO-SATELLITE TRACKING
Satellite to satellite tracking error analysis studies and data processing
[NASA-CR-144832] N77-33237
SATELLITES
Satellite situation report, volume 17, number 4
[NASA-TM-74975] N77-33240
SCALE MODELS
Over-the-wing model thrust reverser noise tests
[NASA-TM-73495] N77-33161
Results of a landing gear loads test using a 0.0405-scale model (16-0) of the space shuttle orbiter in the Rockwell International NAAL wind tunnel [OA163B], volume 1
[NASA-CR-151370] N77-33253
Results of a landing gear loads test using a 0.0405-scale model (16-0) of the space shuttle orbiter in the Rockwell International NAAL wind tunnel [OA163B], volume 2
[NASA-CR-151371] N77-33254
SCANNERS
Demonstration of rapid-scan two-dimensional laser velocimetry in the Langley Vortex Research Facility for research in aerial applications
[NASA-TM-74081] N77-33497
SCATTERING COEFFICIENTS
Relations among Kubelka-Munk coefficients and absorption and scattering coefficients of powders
[AD-A041110] N77-33300
SCATTEROMETERS
Scatterometer receiver dynamic range/linearity
[NASA-CR-151526] N77-33481
Feasibility study of microprocessor systems suitable for use in developing a real-time for the 4.75 GHz scatterometer
[NASA-CR-151522] N77-33586
SCENE ANALYSIS
Dynamic scene analysis: The study of moving images
[AD-A042124] N77-33901
SCHLIEREN PHOTOGRAPHY
Photographic study of rapid events by picosecond techniques
[ISL-CO-214/76] N77-33495
SEA ICE
Stereophotogrammetric reconnaissance of ocean wave/sea ice interaction
N77-33552
SEA STATES
General pattern of the turbid water in the Seto-inland sea extracted from multispectral imageries by the LANDSAT-1 and 2
[E77-10230] N77-33561
SEA TRUTH
Significant applications of LANDSAT-2 MSS data to marine environment — Japanese coastal areas
[E77-10229] N77-33560
SEA WATER
Cathodic kinetics during corrosion of 5456-H117 aluminum alloy by high velocity sea water
[AD-A041218] N77-33320
Cathodic kinetics during corrosion of 5456-H117 aluminum alloy by high velocity sea water
[AD-A041724] N77-33324
Strength of steel fiber concrete in adverse environments
[AD-A041380] N77-33539
Investigation of environmental change pattern in Japan. Classification of shorelines — Nagoya, Yokkaichi, and Ria, Japan
[E77-10224] N77-33555
Application of LANDSAT MSS data to the study of oceanographical environment — Seto Inland Sea
[E77-10228] N77-33559
The biodegradation of oil in sea water for naval pollution control
[AD-A042375] N77-33688
SEALING
Development of low cost, high reliability sealing techniques for hybrid microcircuit packages, phase 2
[NASA-CR-150420] N77-33349
SEALS [STOPPERS]
A magnetic fluid seal for measurement of aerodynamic surface pressure
[AD-A040345] N77-33352
Design considerations in mechanical face seals for improved performance. 2: Lubrication
[NASA-TM-73736] N77-33518
SEARCH PROFILES
The BIOSIS data base: Evaluation of its indexes and the STRATBLDR, CHEMFILE, STAIRS and DIALOG systems for on-line searching
[NASA-CR-2893] N77-33869
SEAS
Investigation of the applications of GEOS-3 radar altimeter data in remote sensing of land and sea features
[NASA-CR-141428] N77-33577
SEATS
Improved seat, console, and workplace design: Annotated bibliography, integration of the literature, accommodation model, and seated operator reach profiles
[AD-A040479] N77-33857
SEDIMENTARY ROCKS
Search for North American microtektites in Georgia coastal plain sediments
[NASA-CR-152596] N77-33719
SEDIMENTS
Seismotectonic, structural, volcanologic, and geomorphic study of New Zealand; indigenous forest assessment in New Zealand; mapping, land use, and environmental studies in New Zealand, volume 1
[E77-10233] N77-33564
Seismotectonic, structural, volcanologic, and geomorphic study of New Zealand; indigenous forest assessment in New Zealand; mapping, land use, and environmental studies in New Zealand, volume 2
[E77-10234] N77-33565
Behavior of mercury, chromium, and cadmium in aquatic systems
[PB-267559/3] N77-33687
Suspended and dissolved solids effects on freshwater biota: A review
[PB-269180/6] N77-33707
SEISMIC WAVES
Guidelines for evaluating the seismic resistance of existing buildings
[AD-A042873] N77-33546
Secondary sources of seismic noise
N77-33714
SEISMOGRAMS
Theoretical seismograms of code phases calculated by a frequency-dependent full wave theory, and their interpretation
N77-33715
An analysis of earthquake frequency data
[AD-A035813] N77-33722
SEISMOGRAPHS
Plate tectonics and the discrimination of underground explosions from earthquakes
[AD-A041904] N77-33729
SELECTIVE DISSEMINATION OF INFORMATION
Safety information system guide
[ERDA-76-45/9] N77-33384
SELENIUM
Creep and relaxation behavior of vapor-deposited amorphous selenium films: Flow behavior of glassy metals
[AD-A041111] N77-34021
SELENOGRAPHY
S-191 sensor performance evaluation
[NASA-CR-151527] N77-33582
SEMICONDUCTING FILMS
Creep and relaxation behavior of vapor-deposited amorphous selenium films: Flow behavior of glassy metals
[AD-A041111] N77-34021
Manufacturing methods and engineering for TFT addressed display
[AD-A041754] N77-34022
SEMICONDUCTORS [MATERIALS]
Superconductivity of polar many-valley semiconductors and semimetals
[NASA-TM-75141] N77-33410
Purification, controlled doping and crystal growth of II-VI compound semiconductors
[AD-A041753] N77-34025
SEMISPAN MODELS
Pressure distributions on a 1- by 3-meter semispan wing with a nonstreamwise tip in subsonic flow
[NASA-TM-72755] N77-33103
SENSORS
A-37B fatigue sensor evaluation program: Full scale test and field aircraft instrumentation
[AD-A042114] N77-33156
SEQUENTIAL ANALYSIS
Markovian queueing systems with stochastically varying arrival rates
[AD-A041969] N77-33943
SERVICE LIFE
Military engine deterioration in service connected with life cycle costs
N77-33183
Progress in determining service life by endurance tests — Concorde aircraft
N77-33195
Life cycle costing: Case studies
[PB-268162/5] N77-34047
SERVICES
Accessibility applications in urban transportation
[PB-269240/8] N77-34059
SET THEORY
Finiteness of simplicial function spaces
N77-33951
SEWAGE
A summary of the test procedures and operational details of an ocean dumping pollution monitoring experiment conducted 7 October 1976
[NASA-TM-74066] N77-33579
SEWAGE TREATMENT
Review of current interest and research in water hyacinth-based wastewater treatment
[NASA-CR-155150] N77-33683
Bachman treatment facility for excessive storm flow in sanitary sewers
[PB-269128/5] N77-34060
SHEAR FLOW
Numerical investigation of confined turbulent shear flows
[LBL-5582] N77-33457
SHEAR LAYERS
On the large-scale structure in turbulent free shear flows
[AD-A042348] N77-33452
SHEAR STRENGTH
Investigation of fabric weave construction versus tear resistance
[AD-A041259] N77-33359
SHIP HULLS
Numerical treatment of arbitrarily-shaped regions in fluid dynamics
[AD-A041741] N77-33451
SHIPS
Seismotectonic, structural, volcanologic, and geomorphic study of New Zealand; indigenous forest assessment in New Zealand; mapping, land use, and environmental studies in New Zealand, volume 2
[E77-10234] N77-33565
US national processing center for GATE: B-scale surface meteorological and radiation system, including instrumentation, processing, and archived data
[PB-268816/6] N77-33766

GATE convection subprogram data center: Comparison of ship-surface, rawinsonde, and tethered sonde wind measurements
[PB-268848/9] N77-33767
SHOCK ABSORBERS
Investigation of an aluminum rolling helix crash energy absorber
[AD-A042084] N77-33132
SHOCK LOADS
A CW HF laser with supersonic premixing and stationary shock initiation
[AD-A041779] N77-33502
SHOCK WAVE ATTENUATION
Shock wave attenuation by perforated plates with various hole sizes
[AD-A041854] N77-33449
SHOCK WAVE INTERACTION
An experimental investigation of shock wave-turbulent boundary layer interactions with and without boundary layer suction: A data summary report
[NASA-CR-2872] N77-33440
SHOCK WAVE PROPAGATION
Theoretical and experimental investigations on shock waves in gas-solid flows
[ILR-18] N77-33468
SHOCK WAVES
Prediction techniques for the characteristics of fin generated three dimensional shock wave turbulent boundary layer interactions
[AD-A042024] N77-33447
Direct initiation of detonation by non-ideal blast waves
[AD-A042811] N77-33454
SHORELINES
Investigation of environmental change pattern in Japan. Classification of shorelines — Nagoya, Yokkaichi, and Ria, Japan
[E77-10224] N77-33555
SHORT HAUL AIRCRAFT
The development of a model for predicting passenger acceptance of short-haul air transportation systems
[NASA-CR-145250] N77-33148
SHORT TAKEOFF AIRCRAFT
Wind tunnel and analytical investigation of over-the-wing propulsion/air frame interferences for a short-haul aircraft at Mach numbers from 0.6 to 0.78 -- - conducted in the Lewis 8 by 6 foot tunnel
[NASA-CR-2905] N77-33114
Longitudinal handling qualities during approach and landing of a powered lift STOL aircraft
[NASA-TM-X-62144] N77-33151
Evaluation of composite wing for XFV-12A airplane
[AD-A041208] N77-33152
YC-14 control system redundancy N77-33214
SHROUDED NOZZLES
Investigation of feasible nozzle configurations for noise reduction in turbofan and turbojet aircraft. Volume 3: Shrouded slot nozzle configurations
[AD-A041782] N77-33179
SIGNAL DETECTION
Point source detection in infrared astronomical surveys
[NASA-CR-152004] N77-34061
SIGNAL ENCODING
Communication system analysis for manned space flight
[NASA-CR-151508] N77-33388
SIGNAL PROCESSING
Digital filtering using burst processing techniques
[AD-A042657] N77-33424
SIGNAL REFLECTION
Alignment technique for locating the reflected signal of an infrared laser off a remote target
[SAND-76-0671] N77-33511
SIGNAL TO NOISE RATIOS
Turbulence measurements by laser anemometry
[AAAF-NT-77-07] N77-33473
Sensor performance report, volume 4 [S-190A]
[NASA-CR-151528] N77-33581
SIGNAL TRANSMISSION
Spatial correlation of transionospheric signal-time-delays
[AD-A041447] N77-33241
Reciprocal acoustic transmission in a mid-ocean environment N77-33955
SILICON CARBIDES
Friction and deformation behavior of single-crystal silicon carbide
[NASA-TP-1053] N77-33350
SILICON DIOXIDE
Temperature measurement of a cutting torch flame containing TiO2- and SiO2-particles
[ISL-R-123/76] N77-33491
SILICON FILMS
Laboratory studies of silicon vapor deposition, phase A — feasibility of producing thin films for photovoltaic applications
[NASA-CR-145236] N77-33296
SILICON NITRIDES
Pressureless sintering of SiAlon gas turbine components
[AD-A041207] N77-33353
SILICON OXIDES
Mullite phase equilibria in the system: CaO-Al2O3-SiO2
[LBL-5706] N77-33329
SILVER
Method for the rapid temperature measurement of silver surfaces
[ISL-R-115/76] N77-33490
SILVER CHLORIDES
Studies of the mechanism of AgCl/Ag electrode reaction N77-33274
SIMULATION
A simulated mission success indicator for use with probability forecasts at Travis AFB, California
[AD-A041880] N77-33751
SIMULATORS
Adiabatic oscillations of the one-dimensional SGEMP boundary layer
[AD-A041960] N77-34008
SINGLE CRYSTALS
Studies of crystal field, temperature, and concentration effects on the lowest triplet states of aromatic molecules in mixed single crystals N77-33292
SINGLE STAGE ROCKET VEHICLES
Technology requirements for advanced earth-orbital transportation systems, dual-mode propulsion
[NASA-CR-2868] N77-33256
SINTERING
Sintering of Al2O3 powder compact by hot stage scanning electron microscopy
[LBL-5763] N77-33330
Pressureless sintering of SiAlon gas turbine components
[AD-A041207] N77-33353
SIZE DETERMINATION
Determination of cardiac size from chest roentgenograms following Skylab missions N77-33819
SKEWNESS
Spiral-like auroral forms: Observations and a proposed theory N77-33713
SKYLAB PROGRAM
Biomedical results from Skylab
[NASA-SP-377] N77-33780
Skylab medical program overview N77-33781
Flight control experiences N77-33782
Skylab crew health: Crew surgeon's report N77-33785
Skylab oral health studies N77-33786
Analysis of the Skylab flight crew health stabilization program N77-33787
Skylab environmental and crew microbiology studies N77-33788
Radiological protection and medical dosimetry for the Skylab crewmen N77-33789
Toxicological aspects of the Skylab program N77-33790
Experiment M131. Human vestibular function N77-33791
The effects of prolonged exposure to weightlessness on postural equilibrium N77-33792
Experiment M133. Sleep monitoring on Skylab N77-33793
Visual light flash observations on Skylab 4 N77-33794
Changes in the Achilles tendon reflexes following Skylab missions N77-33795
Task and work performance on Skylab missions 2, 3, and 4: Time and motion study: Experiment M151 N77-33796
Crew efficiency on first exposure to zero-gravity N77-33797
Mineral and nitrogen metabolic studies, experiment M071 N77-33798
Physiological mass measurements in Skylab N77-33799
Bone mineral measurement: Experiment M078 N77-33800
Muscular deconditioning and its prevention in space flight N77-33801
Biostereometric analysis of body form N77-33802
Biochemical responses of the Skylab crewmen: An overview N77-33803
Cytogenetic studies of blood, experiment M111 N77-33804
The response of single human bells to zero-gravity N77-33805
Blood volume changes N77-33806
Red cell metabolism studies on Skylab N77-33807
Hematology and immunology studies N77-33808
Vectorcardiographic results from Skylab medical experiment M092: Lower body negative pressure N77-33810
Results of Skylab medical experiment M171-metabolic activity N77-33816
Pulmonary function evaluation during and following Skylab space flights N77-33817
Determination of cardiac size from chest roentgenograms following Skylab missions N77-33819
Skylab: A beginning N77-33820
Hardware report for experiment M133, sleep monitoring on Skylab N77-33829
Skylab experiment M131: Rotating little chair N77-33830
Skylab hardware report operational bioinstrumentation system N77-33835
SKYLAB 2
Scatterometer receiver dynamic range/linearity
[NASA-CR-151526] N77-33481
Skylab 2 crew observations and summary N77-33784
SKYLAB 3
Scatterometer receiver dynamic range/linearity
[NASA-CR-151526] N77-33481
Lower body negative pressure: Third manned Skylab mission N77-33809
SKYLAB 4
Skylab 4 crew observations N77-33783
SLEEP
Experiment M133. Sleep monitoring on Skylab N77-33793
Hardware report for experiment M133, sleep monitoring on Skylab N77-33829
SLENDER BODIES
Prediction of static aerodynamic characteristics for slender bodies alone and with lifting surfaces to very high angles of attack
[NASA-TR-R-474] N77-33110
SLENDER CONES
General slender cone simulation at reentry flow conditions
[AD-A041063] N77-33227
SLIDING FRICTION
Friction and deformation behavior of single-crystal silicon carbide
[NASA-TP-1053] N77-33350
SLURRIES
Experimental program for the development of peat gasification
[FE-2469-3] N77-33650
SMOG
Environmental change pattern in central Japan as revealed by LANDSAT data
[E77-10231] N77-33562
SNOW
Seismotectonic, structural, volcanologic, and geomorphic study of New Zealand; indigenous forest assessment in New Zealand; mapping, land use, and environmental studies in New Zealand, volume 1
[E77-10233] N77-33564
Seismotectonic, structural, volcanologic, and geomorphic study of New Zealand; indigenous forest assessment in New Zealand; mapping, land use, and environmental studies in New Zealand, volume 2
[E77-10234] N77-33565
Snowmapping in southern Norway by use of LANDSAT imagery
[E77-10241] N77-33572
SOCIAL FACTORS
The implications in satellite television for social and political change in the third world N77-33231
SODIUM 22
Investigate methods for measuring muscle and bone mass changes in astronauts and animals which occur during space flight
[NASA-CR-151518] N77-33837
SOILS
Applications of remote sensing — Texas, South Dakota, North Dakota, and Kansas
[E77-10183] N77-33553
Application of remote sensing technology to the solution of problems in the management of resources in Indiana
[E77-10223] N77-33554
The application of ERTS imagery to the FAO/Unesco soil map of the world
[E77-10236] N77-33567
Application of remote sensing in South Dakota to provide accurate inventories of agricultural crops, enhance contrast in photographic products, monitor rangeland habitat loss, map Aspen, and prepare hydrogeologic surveys
[E77-10237] N77-33568

Investigation of environmental change pattern in Japan. Observation of present state of agricultural land-use by analysing LANDSAT data
[E77-10243] N77-33574
SOLAR ACTIVITY
Ephemeral active regions during the solar minimum. 1: General properties and trends over the solar cycle. 2: Characteristics of individual ephemeral regions
[AD-A038124] N77-34086
Solar-geophysical data number 392. Part 1: Prompt Reports
[PB-268660/8] N77-34090
SOLAR ACTIVITY EFFECTS
Solar activity and a global survey of precipitation
N77-33743
SOLAR ATMOSPHERE
Research study on dynamics of the solar atmosphere
[AD-A035939] N77-34088
SOLAR CELLS
Investigation of test methods, material properties and processes for solar cell encapsulants
[NASA-CR-155158] N77-33347
Electrical 2-omega-cm 0.046-cm-thick silicon solar cells as a function of intensity and temperature
[NASA-CR-155166] N77-33604
ATS-6 solar cell experiment/improvement
[NASA-CR-152609] N77-33607
Investigation of GaAs solar cell potential performance and cost
[AD-A040736] N77-33612
SOLAR COLLECTORS
Solar collector manufacturing activity
[PB-266985/1] N77-33664
SOLAR COSMIC RAYS
Medium energy charged particle spectrometer. Experiment E8 Helios
[ESA-TT-390] N77-34089
SOLAR CYCLES
Ephemeral active regions during the solar minimum. 1: General properties and trends over the solar cycle. 2: Characteristics of individual ephemeral regions
[AD-A038124] N77-34086
Solar-geophysical data number 392. Part 1: Prompt Reports
[PB-268660/8] N77-34090
SOLAR ENERGY
Solar energy: Policy and prospects
[PB-267986/8] N77-33620
Advanced Thermal Energy Storage [TES] systems
[EPRI-EM-256-SY] N77-33622
Technical and economic feasibility of solar augmentation for boiler feedwater heating in steam-electric power plants
[COO-2864-1] N77-33626
Proceedings of the ERDA Semiannual Solar photovoltaic Program Review Meeting
[CONF-760837-P2] N77-33628
Solar radiation availability for New Mexico
[SAND-77-0004] N77-33654
Ecological considerations of the solar alternatives
[LBL-5927] N77-33655
SOLAR ENERGY CONVERSION
Solar power satellite. Concept evaluation. Activities report. Volume 2: Detailed report
[NASA-TM-74942] N77-33600
Early use of solar energy in buildings. A study of barriers and incentives to the widespread use of solar heating and cooling systems
[PB-267832/4] N77-33618
Design guidelines for energy conserving systems
[PB-268989/1] N77-33670
SOLAR FLARES
Solar-geophysical data number 392. Part 1: Prompt Reports
[PB-268660/8] N77-34090
SOLAR HEATING
Consumer thermal energy storage costs for residential hot water, space heating and space cooling systems
[ANL-K-76-3364-1] N77-33631
SOLAR MAGNETIC FIELD
Heliocentric distance dependence of the interplanetary magnetic field
[NASA-TM-X-71398] N77-34068
SOLAR PROTONS
Charge states of low energy ions from the sun
[NASA-CR-152586] N77-34084
SOLAR RADIATION
Solar radiation availability for New Mexico
[SAND-77-0004] N77-33654
Satellite inferred surface albedo over northwestern Africa
[PB-267835/7] N77-33740
SOLAR RADIO BURSTS
Polarization spectra of centimeter wavelength solar bursts using whole-sun observations
[AD-A038782] N77-34087
SOLAR RADIO EMISSION
The 2-8 GHz solar dynamic spectra and polarization measurement feasibility study
[NASA-CR-152604] N77-34085
Polarization spectra of centimeter wavelength solar bursts using whole-sun observations
[AD-A038782] N77-34087
SOLAR WIND
On the role of magnetic mirroring in the auroral phenomena
[NASA-CR-155144] N77-33717
Interplanetary medium data book
[NASA-TM-X-72614] N77-34065
Interplanetary medium data book, appendix
[NASA-TM-X-72615] N77-34066
Heliocentric distance dependence of the interplanetary magnetic field
[NASA-TM-X-71398] N77-34068
SOLDERING
Solderability testing of microcircuits
[AD-A041203] N77-33413
SOLDERS
Solderability testing of microcircuits
[AD-A041203] N77-33413
SOLID LUBRICANTS
Fundamental considerations for future solid lubricants
[NASA-TM-X-52659] N77-33351
SOLID PROPELLANT ROCKET ENGINES
Propellant surveillance report LGM-30 F and G stage. Phase E: Series 3, TP-H1011
[AD-A041671] N77-33373
SOLID SURFACES
Temperature programmed exchange studies of supported metal catalysts
N77-33281
SOLID WASTES
Reclamation of energy from solid waste: Theory and practice. A selected, annotated bibliography for Pennsylvania local government officials
[PB-267800/1] N77-33621
SOLID-SOLID INTERFACES
Green's function calculation of a metal-metal interface
[AD-A041918] N77-34019
SOLIDIFICATION
Directional solidification of polymers in a temperature gradient
N77-33344
SOLIDS
Interaction of pulsed CO2 and pulsed HF/DF laser radiation with gaseous and solid targets
[AD-A041486] N77-33500
Measurement of solid friction parameters of ball bearings
[AD-A042599] N77-33528
SOLUBILITY
Immiscible flow by finite elements
[STF71-A76017] N77-33466
SOLVENTS
A study of the hemin heterogeneous rate constant in non-aqueous solvents with on-line coulostatic system
N77-33275
SONDES
Lidar detection of subvisible reentry vehicle erosive atmospheric material
[AD-A041085] N77-33724
SORBENTS
Development of air-monitoring techniques using solid sorbents. LASL Project R-059, NIOSH-IA-77-12
[LA-6738-PR] N77-33693
SORPTION
Hydrogen solubility in rare earth intermetallic compounds
N77-33288
SOUND GENERATORS
Methods for the electronic simulation of flight sounds
[NASA-TT-F-17432] N77-33956
SOUND INTENSITY
Industrial sound level meter internal noise in octave bands test
[PB-268952/9] N77-33963
SOUTH AFRICA
Monitoring the extent and occurrence of fire in the different veld types of South Africa with particular reference to its ecological role and role in range management
[E77-10226] N77-33557
SOUTH DAKOTA
Applications of remote sensing — Texas, South Dakota, North Dakota, and Kansas
[E77-10183] N77-33553
Application of remote sensing in South Dakota to provide accurate inventories of agricultural crops, enhance contrast in photographic products, monitor rangeland habitat loss, map Aspen, and prepare hydrogeologic surveys
[E77-10237] N77-33568
SPACE CHARGE
Specification of geosynchronous plasma environment
[AD-A041910] N77-33244
SPACE ERECTABLE STRUCTURES
AAFE large deployable antenna development program: Executive summary
[NASA-CR-2894] N77-33260
Millimeter-wave antenna design
[NASA-CR-152608] N77-33409
SPACE EXPLORATION
Advanced planetary studies
[NASA-CR-155054] N77-34071
Advanced planetary studies
[NASA-CR-155055] N77-34072
Report of the Terrestrial Bodies Science Working Group. Volume 2: Mercury
[NASA-CR-155188] N77-34075
Report of the Terrestrial Bodies Science Working Group. Volume 3: Venus
[NASA-CR-155187] N77-34076
Report of the Terrestrial Bodies Science Working Group. Volume 5: Mars
[NASA-CR-155185] N77-34078
Report of the Terrestrial Bodies Science Working Group. Volume 7: The Galilean satellites
[NASA-CR-155183] N77-34080
Report of the Terrestrial Bodies Science Working Group. Volume 8: The comets
[NASA-CR-155181] N77-34081
Report of the Terrestrial Bodies Science Working Group. Volume 9: Complementary research and development
[NASA-CR-155181] N77-34082
SPACE FLIGHT FEEDING
Skylab 4 crew observations
N77-33783
SPACE FLIGHT STRESS
Biomedical results from Skylab
[NASA-SP-377] N77-33780
Biostereometric analysis of body form
N77-33802
SPACE LABORATORIES
Studies of orbital Boetvoes experiments
[NASA-CR-155193] N77-33226
SPACE MISSIONS
Propellant management report for the Titan Centaur TC-5 extended mission
[NASA-TM-73749] N77-33232
Report of the Terrestrial Bodies Science Working Group. Volume 1: Executive summary — Terrestrial planets, Galilean satellites, Comets, Asteroids, and the Moon
[NASA-CR-155189] N77-34074
Report of the Terrestrial Bodies Science Working Group. Volume 2: Mercury
[NASA-CR-155188] N77-34075
Report of the Terrestrial Bodies Science Working Group. Volume 3: Venus
[NASA-CR-155187] N77-34076
Report of the Terrestrial Bodies Science Working Group. Volume 4: The moon — lunar polar orbiter mission
[NASA-CR-155186] N77-34077
Report of the Terrestrial Bodies Science Working Group. Volume 5: Mars
[NASA-CR-155185] N77-34078
Report of the Terrestrial Bodies Science Working Group. Volume 6: The asteroids
[NASA-CR-155184] N77-34079
Report of the Terrestrial Bodies Science Working Group. Volume 8: The comets
[NASA-CR-155181] N77-34081
SPACE PROCESSING
Integrated study plan for space bioprocessing [phase 1]
[NASA-CR-155170] N77-33221
Space processing applications of ion beam technology — surface finishing, welding, milling and film deposition
[NASA-CR-135261] N77-33222
SPACE PROGRAMS
Standard spacecraft economic analysis. Volume 2: Findings and conclusions
[NASA-CR-152539] N77-33225
New model framework and structure and the commonality evaluation model — concerning unmanned spacecraft projects
[NASA-CR-155157] N77-33249
SPACE SHUTTLE ORBITERS
Flow-field surveys on the windward side of the NASA 040A space shuttle orbiter at 31 deg angle of attack and Mach 20 in helium
[NASA-TM-X-3560] N77-33236
Orbiter/payload proximity operations: Lateral approach technique
[NASA-TM-74965] N77-33247
Spacelab contamination assessment. Payload/orbiter contamination control requirement study
[NASA-CR-150413] N77-33248
Results of a landing gear loads test using a 0.0405-scale model [16-0] of the space shuttle orbiter in the Rockwell International NAAL wind tunnel [OA163B], volume 1
[NASA-CR-151370] N77-33253
Results of a landing gear loads test using a 0.0405-scale model [16-0] of the space shuttle orbiter in the Rockwell International NAAL wind tunnel [OA163B], volume 2
[NASA-CR-151371] N77-33254
Entry dynamics of space shuttle orbiter with longitudinal stability and control uncertainties at supersonic and hypersonic speeds
[NASA-TP-1084] N77-33259

SPACE SHUTTLES
Shuttle payload vibroacoustic test plan evaluation. Free flyer payload applications and sortie payload parametric variations
[NASA-CR-152594] N77-33250
Space shuttle program: Lightning protection criteria document
[NASA-TM-74974] N77-33252
A study of selected environmental quality remote sensors for free flyer missions launched from the space shuttle
[NASA-CR-145252] N77-33585
Space shuttle life sciences requirements development and documentation
[NASA-CR-151529] N77-33838

SPACE STATIONS
Space station systems analysis study. Part 3: Documentation. Volume 4: Supporting research and technology report
[NASA-CR-151521] N77-33238
Space station systems analysis study. Part 3: Documentation. Volume 5: Cost and schedule data
[NASA-CR-151520] N77-33239
Solar power satellite. Concept evaluation. Activities report. Volume 2: Detailed report
[NASA-TM-74942] N77-33600

SPACE TRANSPORTATION
Technology requirements for advanced earth-orbital transportation systems: Summary report — single stage to orbit vehicles
[NASA-CR-2867] N77-33255
Technology requirements for advanced earth-orbital transportation systems, dual-mode propulsion
[NASA-CR-2868] N77-33256

SPACE-TIME FUNCTIONS
Space and time evolution of two nonlinearly coupled variables: Special solutions
[IPPJ-273] N77-33910

SPACECRAFT
Standard spacecraft economic analysis. Volume 1: Executive summary
[NASA-CR-152538] N77-33224

SPACECRAFT CHARGING
Active experiments in modifying spacecraft potential: Results from ATS-5 and ATS-6
[NASA-CR-152607] N77-33262

SPACECRAFT COMMUNICATION
The implications in satellite television for social and political change in the third world
N77-33231
Reduced state viterbi detector demonstration
[AD-A041712] N77-33396

SPACECRAFT CONTAMINATION
Spacelab contamination assessment. Payload/orbiter contamination control requirement study
[NASA-CR-150413] N77-33248

SPACECRAFT DESIGN
Standard spacecraft economic analysis. Volume 2: Findings and conclusions
[NASA-CR-152539] N77-33225
Calibration of Viking imaging system pointing, image extraction, and optical navigation measure
[NASA-CR-155165] N77-33235

SPACECRAFT INSTRUMENTS
Geology orbiter comparison study
[NASA-CR-155056] N77-34073

SPACECRAFT PERFORMANCE
Calibration of Viking imaging system pointing, image extraction, and optical navigation measure
[NASA-CR-155165] N77-33235

SPACECRAFT PROPULSION
Technology requirements for advanced earth-orbital transportation systems: Summary report — single stage to orbit vehicles
[NASA-CR-2867] N77-33255
Technology requirements for advanced earth-orbital transportation systems, dual-mode propulsion
[NASA-CR-2868] N77-33256

SPACECRAFT SHIELDING
Space shuttle program: Lightning protection criteria document
[NASA-TM-74974] N77-33252

SPACECRAFT TRACKING
Satellite situation report, volume 17, number 4
[NASA-TM-74975] N77-33240

SPACECREWS
Biomedical results from Skylab
[NASA-SP-377] N77-33780
Flight control experiences
N77-33782
Skylab 4 crew observations
N77-33783
Skylab 2 crew observations and summary
N77-33784
Skylab crew health: Crew surgeon's report
N77-33785
Skylab oral health studies
N77-33786
Analysis of the Skylab flight crew health stabilization program
N77-33787
Skylab environmental and crew microbiology studies
N77-33788
Radiological protection and medical dosimetry for the Skylab crewmen
N77-33789
Toxicological aspects of the Skylab program
N77-33790
Experiment M131. Human vestibular function
N77-33791
The effects of prolonged exposure to weightlessness on postural equilibrium
N77-33792
Experiment M133. Sleep monitoring on Skylab
N77-33793
Visual light flash observations on Skylab 4
N77-33794
Changes in the Achilles tendon reflexes following Skylab missions
N77-33795
Crew efficiency on first exposure to zero-gravity
N77-33797
Mineral and nitrogen metabolic studies, experiment M071
N77-33798
Physiological mass measurements in Skylab
N77-33799
Bone mineral measurement: Experiment M078
N77-33800
Muscular deconditioning and its prevention in space flight
N77-33801
Biostereometric analysis of body form
N77-33802
Biochemical responses of the Skylab crewmen: An overview
N77-33803
Cytogenetic studies of blood, experiment M111
N77-33804
Blood volume changes
N77-33806
Red cell metabolism studies on Skylab
N77-33807
Hematology and immunology studies
N77-33808
Vectorcardiographic results from Skylab medical experiment M092: Lower body negative pressure
N77-33810

SPACELAB
Feasibility analysis of gravitational experiments in space
[NASA-CR-155148] N77-33223
Spacelab contamination assessment. Payload/orbiter contamination control requirement study
[NASA-CR-150413] N77-33248
Mission definition for the first flight of a multidisciplinary lidar system formulated following discussions with representatives of various institutes
[DLR-IB-553-76/4] N77-33513
Multidisciplinary lidar system in Spacelab for application to atmospheric physics and remote sensing — aerosols and trace gases
[ESA-TT-404] N77-33739

SPACELAB PAYLOADS
Spacelab contamination assessment. Payload/orbiter contamination control requirement study
[NASA-CR-150413] N77-33248
Space shuttle life sciences requirements development and documentation
[NASA-CR-151529] N77-33838

SPARE PARTS
Major system acquisition: Is a separate spares contract better
[AD-A042775] N77-34033

SPATIAL DISTRIBUTION
Spatial correlation of transionospheric signal-time-delays
[AD-A041447] N77-33241
A spatial frequency analysis model for predicting human performance at visual pattern matching tasks
[AD-A041649] N77-33859

SPECIFIC HEAT
Heat capacity and enthalpy of liquids. 3: Halogenated ethanes and ethylenes
[ESDU-77007] N77-33273

SPECIFICATIONS
Architecture of the BNL archive and dissemination system
[BNL-22445] N77-34038

SPECTROMETERS
Medium energy charged particle spectrometer. Experiment E8 Helios
[ESA-TT-390] N77-34089

SPECTRORADIOMETERS
S-191 sensor performance evaluation
[NASA-CR-151527] N77-33582

SPECTRUM ANALYSIS
Exploratory study of turbulence in air intakes
[AAAF-NT-77-17] N77-33471
Turbulence measurements by laser anemometry
[AAAF-NT-77-07] N77-33473
Solid-state laser wavelength identification using a reference absorber
[AD-A041689] N77-33503

SPHERES
Direct initiation of detonation by non-ideal blast waves
[AD-A042811] N77-33454

SPHERICAL SHELLS
Radiative transfer in spherical shell atmospheres. 2: Asymmetric phase functions
[NASA-CR-155162] N77-33443

SPIN TESTS
Spin-tunnel investigation of the spinning characteristics of typical single-engine general aviation airplane designs. 1. Low-wing model A: Effects of tail configurations
[NASA-TP-1009] N77-33111

SPLITTING
Improved convergence for linear systems using three-part splittings
[AD-A041729] N77-33914

SPRAYING
Notes on the pollution of airplanes and helicopters by chemicals during agricultural jobs
[NASA-TT-F-17444] N77-33129

SPUTTERING
X-Ray photoelectron spectroscopy study of radiofrequency-sputtered titanium, carbide, molybdenum carbide, and titanium boride coatings and their friction properties
[NASA-TP-1033] N77-33348

STAINLESS STEELS
Fatigue crack growth at elevated temperature 316 stainless steel and H-13 steel
[NASA-CR-135105] N77-33314
Laser induced desorption of gas from stainless steel surfaces
[AD-A042323] N77-33325
Intergranular stress corrosion cracking of sensitized stainless steels
[BNL-NUREG-50596] N77-33328

STANDARDIZATION
Standardization, certification, maintenance, and dissemination of large scale engineering software systems
[NASA-CP-2015] N77-33876
NATO standardization versus US data releasability: An approach to resolving the conflict
[AD-A042959] N77-34053

STANDARDS
Design guidelines for energy conserving systems
[PB-268989/1] N77-33670
Inspection of Federal facilities for compliance with noise abatement standards
[PB-269298/6] N77-33704
Need for noise standards
[ELAB-STF44-A75044] N77-33962
Critical evaluation of data in the physical sciences. A status report on the national standard reference data system, January 1977
[PB-268513/9] N77-34040

STATIC STABILITY
Static and dynamic response calculations for the new Coulport launcher piston assembly
[NCRE/N206] N77-33534

STATIONARY ORBITS
Mathematical model for ascent trajectory optimization of a 4-stage launch vehicle for geosynchronous missions
[ESA-TT-409] N77-33246

STATISTICAL ANALYSIS
Analysis of air accidents involving airplanes or helicopters of various types of application
[NASA-TT-F-17443] N77-33128
Energy statistics: A supplement to the summary of national transportation statistics
[PB-269301/8] N77-33672
On differentials, asymptotic normality and almost sure behavior of statistical functions, with application to M-statistics for location parameters
[AD-A042661] N77-33935
A differential for L-statistics
[AD-A042683] N77-33936

STATISTICAL DECISION THEORY
On slippage tests and multiple decision [selection and ranking] procedures
[AD-A041746] N77-33933

STATISTICAL DISTRIBUTIONS
A characterization of convoluted geometric distributions
[AD-A042136] N77-33931

STATISTICAL TESTS
On slippage tests and multiple decision [selection and ranking] procedures
[AD-A041746] N77-33933

STATISTICAL WEATHER FORECASTING
Weather forecasting and weather forecasts: Models, systems and users. Volume 2: Notes from a colloquium
[PB-268914/9] N77-33775

STEADY FLOW
Three dimensional steady and unsteady asymmetric flow past wings of arbitrary planforms
[NASA-CR-145235] N77-33102

STEADY STATE
Steady-state unbalance response of a three-disk flexible rotor on flexible, damped supports
[NASA-TM-X-73666] N77-33160

STEELS
Powder processing of trip steel
[AD-A041069] N77-33318
A treatment of the subject of tearing instability
[PB-270277/7] N77-33335
Effect of double vacuum melting and retained austenite on rolling-element fatigue life of AMS 5749 bearing steel
[NASA-TP-1060] N77-33520
Electromechanical machining
[AD-A042545] N77-33527
Corrosion behavior of steel fibrous concrete
[AD-A041339] N77-33538
Strength of steel fiber concrete in adverse environments
[AD-A041380] N77-33539

STELLAR EVOLUTION
Recognition of compact astrophysical objects
[NASA-SP-421] N77-34063

STELLAR SPECTROPHOTOMETRY
A photometric study of the Orion OB 1 association. 3: Subgroup analyses
[NASA-TM-X-71407] N77-34062

STELLARATORS
Rotational transform angle of the stellarator field with twisted coils
[IPPJ-271] N77-34016

STEREOPHOTOGRAPHY
Stereophotogrammetric reconnaissance of ocean wave/sea ice interaction
N77-33552

STOCHASTIC PROCESSES
High angle of attack flight control using stochastic model reference adaptive control
[AD-A041436] N77-33897
Estimating the lag in a nonlinear time series model
[AD-A042451] N77-33921
Stochastic approximation algorithms for the sequential Monte Carlo optimization of stochastic systems
N77-33928

STORAGE BATTERIES
Redox bulk energy storage system study, volume 1
[NASA-CR-135206-VOL-1] N77-33608
Redox bulk energy storage system study, volume 2
[NASA-CR-135206-VOL-2] N77-33609
Instrumentation for automatic cycling of lithium-aluminum/iron sulfide secondary cells
[ANL-76-119] N77-33633

STORMS
Relationship between lake-induced disturbances and synoptic circulation
[PB-269406/5] N77-33741
Greatest known areal storm rainfall depths for the contiguous United States
[PB-268871/1] N77-33759

STRATOSPHERE
The use of lidar for stratospheric measurements
[NASA-TM-74085] N77-33498
Calculation of selected atmospheric composition parameters for the mid-latitude, September stratosphere
[AD-A041081] N77-33725

STREETS
Land use and arterial spacing in suburban areas
[PB-269353/9] N77-34057

STRESS (PHYSIOLOGY)
Response of the cardiovascular system to vibration and combined stresses
[AD-A039000] N77-33848
Neurophysiological estimates of human performance capabilities in aerospace systems
[AD-A038208] N77-33849
Psychometric characteristics of astronauts
[AD-A039228] N77-33855

STRESS ANALYSIS
A general three-dimensional computational model for nonlinear composite structures and materials
[AD-A041413] N77-33269
Nonlinear anelastic behavior of a synthetic rubber at finite strains
[AD-A041777] N77-33363
Plane grillage suite of programs
[NCRE/R637] N77-33533
A portable residual stress analyzer
[AD-A041831] N77-33542
Applications of the extremal principles of elasticity to the determination of stress intensity factors
[AD-A042669] N77-33545

STRESS CONCENTRATION
Biaxial testing of graphite/epoxy composites containing stress concentrations, part 1
[AD-A041490] N77-33268
Direct determination of flexural strains in plates using projected gratings
[AD-A041917] N77-33537

STRESS CORROSION
Reactions and electrochemical kinetics of newly-generated metal surfaces
[AD-A036570] N77-33317

STRESS CORROSION CRACKING
Mechanism of stress-corrosion cracking
[AD-A042106] N77-33322
Intergranular stress corrosion cracking of sensitized stainless steels
[BNL-NUREG-50596] N77-33328

STRESS MEASUREMENT
Geometrical problems with a position sensitive detector employed on a diffractometer: Its use in the measurement of stress
[AD-A041102] N77-33484
A Bayesian model for determining the optimal test stress for a single test unit
[AD-A041232] N77-33530

STRESS RELAXATION
Role of stress effects in the oxidation behavior of high temperature alloys
[CONF-761057-4] N77-33333

STRUCTURAL ANALYSIS
Primary Adhesively Bonded Structure Technology [PABST]. Phase IB: Preliminary design
[AD-A041536] N77-33354
Plane grillage suite of programs
[NCRE/R637] N77-33533
PLANS; a finite element program for nonlinear analysis of structures. Volume 2: User's manual
[NASA-CR-145244] N77-33535
On dynamic plastic mode form solutions
[AD-A042361] N77-33543
Coupling of X-ray deposition structural response
[AD-A042667] N77-33544
Nonlinear formulation of finite element by corotational coordinates
[ANL-CT-77-9] N77-33548
Research initiation: Mixed and hybrid finite element analysis of problems in structural mechanics
[PB-268300/1] N77-33550
Standardization, certification, maintenance, and dissemination of large scale engineering software systems
[NASA-CP-2015] N77-33876

STRUCTURAL BASINS
Snowmapping in southern Norway by use of LANDSAT imagery
[E77-10241] N77-33572

STRUCTURAL DESIGN
AAFE large deployable antenna development program: Executive summary
[NASA-CR-2894] N77-33260
A research program to reduce interior noise in general aviation airplanes. Design of an acoustic panel test facility
[NASA-CR-155152] N77-33957

STRUCTURAL ENGINEERING
Engine structural integrity program [ENSIP]
N77-33182
Military engine deterioration in service connected with life cycle costs
N77-33183
Guidelines for evaluating the seismic resistance of existing buildings
[AD-A042873] N77-33546

STRUCTURAL PROPERTIES (GEOLOGY)
Structural lineament and pattern analysis of Missouri, using LANDSAT imagery
[E77-10239] N77-33570

STRUCTURAL VIBRATION
Modeling and parameter uncertainties for aircraft flight control system design
[NASA-CR-2887] N77-33149
Design and development of a structural mode control system
[NASA-CR-143846] N77-33201
Wind tunnel study of an active flutter suppression system
N77-33215

STRUCTURAL WEIGHT
An elementary analysis of the effect of sweep, Mach number, and lift coefficient on wing-structure weight
[NASA-TM-74072] N77-33146

STRUTS
Investigation of an aluminum rolling helix crash energy absorber
[AD-A042084] N77-33132

SUBLIMATION
Ice in space: An experimental and theoretical investigation
[NASA-CR-150417] N77-34067

SUBROUTINE LIBRARIES (COMPUTERS)
Aggregated shorads attrition weapon deck — subroutine libraries [computers]
[AD-A040390] N77-33242

SUBROUTINES
EPISODE: An effective package for the integration of systems of ordinary differential equations — including boundary value problems
[UCID-30112-REV-1] N77-33925

SUBSONIC AIRCRAFT
NSEG: A segmented mission analysis program for low and high speed aircraft. Volume 2: Program users manual
[NASA-CR-2808] N77-33100
A suspended anemometer system for measuring true airspeed on low-speed airplanes
[NASA-TN-D-8523] N77-33157

SUBSONIC FLOW
Pressure distributions on a 1- by 3-meter semispan wing with a nonstreamwise tip in subsonic flow
[NASA-TM-72755] N77-33103
The effect of flight on the noise of subsonic jets
[AD-A041730] N77-33176
Supersonic jet exhaust noise investigation. Volume 4: Acoustic far-field/near-field data report
[AD-A041819] N77-33177
Subsonic diffuser with injection flow
[RM-644] N77-33441

SUBSONIC WIND TUNNELS
Wind tunnel and analytical investigation of over-the-wing propulsion/air frame interferences for a short-haul aircraft at Mach numbers from 0.6 to 0.78 -- conducted in the Lewis 8 by 6 foot tunnel
[NASA-CR-2905] N77-33114

SUBSTRATES
The effects of substrate composition on thick film circuit reliability
[AD-A041572] N77-33416

SUBURBAN AREAS
Land use and arterial spacing in suburban areas
[PB-269353/9] N77-34057

SUCTION
An experimental investigation of shock wave-turbulent boundary layer interactions with and without boundary layer suction: A data summary report
[NASA-CR-2872] N77-33440

SULFATES
Chemical-analytical techniques for aerosols
[BNL-22440] N77-33690

SULFUR
Sulfur poisoning of hydrocarbon oxidation by palladium
[NASA-CR-155192] N77-33264
Determination of sulfur speciation in industrial aerosols in an SO2 rich environment
[COO-2988-1] N77-33692

SULFUR DIOXIDES
Determination of sulfur speciation in industrial aerosols in an SO2 rich environment
[COO-2988-1] N77-33692

SUNSPOT CYCLE
Ephemeral active regions during the solar minimum. 1: General properties and trends over the solar cycle. 2: Characteristics of individual ephemeral regions
[AD-A038124] N77-34086

SUPERCONDUCTING POWER TRANSMISSION
Power transmission project
[BNL-22202] N77-33426

SUPERCONDUCTIVITY
Superconductivity of polar many-valley semiconductors and semimetals
[NASA-TM-75141] N77-33410

SUPERCONDUCTORS
Superconducting magnetic calibration source for magnetic anomaly detection MAD operations
[AD-A041738] N77-33421

SUPERCRITICAL FLOW
The numerical calculation of steady inviscid supercritical flow past ellipsoids without circulation
[AD-A041016] N77-33453
Theoretical and experimental investigations on shock waves in gas-solid flows
[ILR-18] N77-33468

SUPERCRITICAL WINGS
Transonic wind-tunnel investigation of the maneuver potential of the NASA supercritical wing concept, phase I
[NASA-TM-X-3534] N77-33115
Transonic aerodynamic characteristics of a supercritical-wing transport model with trailing-edge controls
[NASA-TM-X-3431] N77-33116
Transonic aerodynamic characteristics of a supercritical-wing transport model with trailing-edge controls, supplement, part I
[NASA-TM-X-3431-PT-1] N77-33117
Transonic aerodynamic characteristics of a supercritical-wing transport model with trailing-edge controls
[NASA-TM-X-3431-PT-2] N77-33118
Transonic aerodynamic characteristics of a supercritical-wing transport model with trailing edge controls
[NASA-TM-X-3431-PT-3] N77-33119
Transonic aerodynamic characteristics of a supercritical-wing transport model with trailing-edge controls
[NASA-TM-X-3431-PT-4] N77-33120

SUPERSONIC COMBUSTION RAMJET ENGINES
Subsonic longitudinal aerodynamic characteristics and engine pressure distributions for an aircraft with an integrated scramjet designed for Mach 6 cruise — conducted in Langley 7 by 10 foot high speed tunnel
[NASA-TM-X-73911] N77-33108

SUPERSONIC FLOW
Supersonic jet exhaust noise investigation. Volume 4: Acoustic far-field/near-field data report
[AD-A041819] N77-33177
A CW HF laser with supersonic premixing and stationary shock initiation
[AD-A041779] N77-33502

SUPERSONIC SPEEDS
Investigation of supersonic turbulent boundary-layer separation on a compression ramp by an integral method
[NASA-TM-74065] N77-33439

SUPERSONIC TURBINES
Progress in determining service life by endurance tests — Concorde aircraft
N77-33195

SUPERSONICS
Unsteady supersonic aerodynamic theory for interfering surfaces by the method of potential gradient
[NASA-CR-2898] N77-33121

SUPPLEMENTS
Interplanetary medium data book, appendix
[NASA-TM-X-72615] N77-34066

SUPPORT SYSTEMS
Experiment support system
N77-33831
In-flight medical support system
N77-33832

SURFACE FINISHING
Space processing applications of ion beam technology — surface finishing, welding, milling and film deposition
[NASA-CR-135261] N77-33222

SURFACE PROPERTIES
The surface chemistry of acrylic polymer colloids
N77-33345
Mirror reactor surface study
[UCID-17168] N77-34012

SURFACE TEMPERATURE
Gulfstream: Monthly publications, January-December 1976. Volume 2, numbers 1-12
[PB-262216/9] N77-33779

SURFACE TO AIR MISSILES
Aggregated shorads attrition weapon deck — subroutine libraries [computers]
[AD-A040998] N77-33242

SURVEYS
Building energy handbook. Volume 1: Methodology for energy survey and appraisal
[ERDA-76-163/1-VOL-1] N77-33658
Building energy handbook. Volume 2: Forms for energy survey and appraisal
[ERDA-76-163/2-VOL-2] N77-33659

SUSPENDING [MIXING]
Suspended and dissolved solids effects on freshwater biota: A review
[PB-269180/6] N77-33707

SWEEP ANGLE
An elementary analysis of the effect of sweep, Mach number, and lift coefficient on wing-structure weight
[NASA-TM-74072] N77-33146

SWEPT WINGS
Pressure distributions on a 1- by 3-meter semispan wing with a nonstreamwise tip in subsonic flow
[NASA-TM-72755] N77-33103
An elementary analysis of the effect of sweep, Mach number, and lift coefficient on wing-structure weight
[NASA-TM-74072] N77-33146
Technical and economic assessment of swept-wing span-distributed load concepts for civil and military air cargo transports
[NASA-CR-145229] N77-33147

SWITCHING CIRCUITS
Repetitive series interrupter II
[AD-A041144] N77-33419

SYMBOLIC PROGRAMMING
Symbolic testing: Design techniques, costs and effectiveness
[PB-268517/0] N77-33890

SYNCHRONISM
Time division multiplex frame synchronization: Acquisition, maintenance and reacquisition
[AD-A041384] N77-33435
Special relativity and the conventionality of simultaneity
N77-34027

SYNCHRONOUS SATELLITES
Specification of geosynchronous plasma environment
[AD-A041910] N77-33244
Comparative systems study of magnetically suspended flywheels — for stationary satellites with flexible appendages
[ESA-TT-393] N77-33245

SYNTHETIC RUBBERS
Nonlinear anelastic behavior of a synthetic rubber at finite strains
[AD-A041777] N77-33363

SYSTEMS ANALYSIS
Space station systems analysis study. Part 3: Documentation. Volume 4: Supporting research and technology report
[NASA-CR-151521] N77-33238
Space station systems analysis study. Part 3: Documentation. Volume 5: Cost and schedule data
[NASA-CR-151520] N77-33239
Feasibility and systems definition study for Microwave Multi-Application Payload [MMAP]
[NASA-CR-152611] N77-33251
Reflections of regional environmental systems
[ORNL-RUS-26] N77-33695
Operations of the National Weather Service
[PB-268041/1] N77-33754
Interactive system design considerations
[PU1R2/76] N77-33863
Maintenance for the NET-2 network analysis program
[AD-A041074] N77-33896
An introduction to the theory of linear systems
[AD-A042690] N77-33939
Architecture of the BNL archive and dissemination system
[BNL-22445] N77-34038

SYSTEMS ENGINEERING
Earth station design at 12/14 GHz
[NASA-CR-152597] N77-33234
System integration and interface transition issues
[AD-A041457] N77-33393
Feasibility study of a 400 Hz, 4160 volt 3-phase electrical power distribution system
[AD-A042042] N77-33422
Transparent materials processing system
[NASA-CR-150411] N77-33516
Systems engineering for power
[ERDA-77-37] N77-33651
Systems studies of energy conservation: Methane produced from coalbeds, volume 1
[MERC/CR-77/4-VOL-1] N77-33660
A.e. in-flight blood collection system
N77-33825

SYSTEMS MANAGEMENT
Systems engineering for power
[ERDA-77-37] N77-33651

T

TACAN
Special evaluation report on TACAN propagation
[AD-A041191] N77-33134

TAIL ASSEMBLIES
Spin-tunnel investigation of the spinning characteristics of typical single-engine general aviation airplane designs. 1. Low-wing model A: Effects of tail configurations
[NASA-TP-1009] N77-33111

TANKS [CONTAINERS]
Vapor ingestion in Centaur liquid-hydrogen tank
[NASA-TP-1061] N77-33444

TANTALUM ALLOYS
Properties of thermally contracting tantalum tungstate
[Y-2071] N77-33306

TARGET RECOGNITION
The maximum detection range and the maximum recognition distance when observing ground targets from helicopters
[DLR-IB-553-76/3] N77-33861

TASKS
Task and work performance on Skylab missions 2, 3, and 4: Time and motion study: Experiment M151
N77-33796
First study of job control languages
[PU1R3/76] N77-33889

TAYLOR SERIES
On the use of finite Taylor's series approximations to certain exponential and power functions employed in cloud models
[PB-267834/0] N77-33762

TEACHING MACHINES
Intelligent on-line assistant and tutor system
[AD-A041727] N77-33880

TECHNICAL WRITING
Coverage of journal articles by selected US disciplinary science and technology abstracting and indexing services and its relationship to other characteristics of the scientific and technical literature, particularly citations
N77-34036
Perceived environmental uncertainty and the two-step flow process of scientific and technical communication in research and development laboratories
N77-34037

TECHNOLOGICAL FORECASTING
Analysis and forecast of electrical distribution system materials. Volume 3: Appendix
[CONS/2050-1-VOL-3-APP] N77-33430

TECHNOLOGY ASSESSMENT
An assessment of the hover performance of the XH-59A advancing blade concept demonstration helicopter
[AD-A042063] N77-33155
An assessment of the role of simulators in military flight training. Volume 1: Assessment based on survey interviews
[AD-A041222] N77-33217
Technology requirements for advanced earth-orbital transportation systems: Summary report — single stage to orbit vehicles
[NASA-CR-2867] N77-33255
An assessment of the linkage of research in electrochemistry with its ramifications for industry
[PB-269224/2] N77-33311
Preliminary assessment of relative toxicity of ethyl centralite [N, N prime-diethylcarbanilide]
[AD-A041736] N77-33371
From Soup to Nuts: The 7th International Congress on Rheology
[AD-A041227] N77-33445
Compendium of critiques of JPL report SP-43-17: Automotive technology status and projections project
[NASA-CR-155180] N77-33519
Application of remote sensing for planning purposes
[NASA-CR-150418] N77-33589

TECHNOLOGY TRANSFER
Earth resources-regional transfer activity contracts review
[NASA-TM-78130] N77-33578
Spinoff 1977: An annual report
[NASA-TM-74908] N77-34049
NATO standardization versus US data releasability: An approach to resolving the conflict
[AD-A042959] N77-34053

TECHNOLOGY UTILIZATION
Progress in advanced high temperature turbine materials, coatings, and technology
[NASA-TM-X-73628] N77-33159
Recent advances in lightweight, filament-wound composite pressure vessel technology
[NASA-TM-73699] N77-33265
Appropriate technology: A directory of activities and projects
[PB-267970/2] N77-34052

TECTONICS
Thaumasia: A fossilized, early-forming Tharsis uplift
[NASA-TM-X-71404] N77-33710

TEKTITES
Search for North American microtektites in Georgia coastal plain sediments
[NASA-CR-152596] N77-33719

TELECOMMUNICATION
Earth station design at 12/14 GHz
[NASA-CR-152597] N77-33234
Earth-space attenuation prediction procedures at 4 to 16 GHz
[PB-269228/3] N77-33402

TELEMETRY
Data Processing for the S3 satellites
[AD-A041912] N77-33243

TEMPERATURE CONTROL
Design report for the ACES demonstration house
[ORNL-CON-1] N77-33641

TEMPERATURE EFFECTS
Electrical 2-omega-cm 0.046-cm-thick silicon solar cells as a function of intensity and temperature
[NASA-CR-155166] N77-33604
End pluggings of a linear theta pinch by hot high Z plasmas of high mass number
[IPPJ-262] N77-33979
Nonlinear propagation of the ordinary mode in a hot magnetoplasma
[IPPJ-265] N77-33982

TEMPERATURE GRADIENTS
Directional solidification of polymers in a temperature gradient
N77-33344

TEMPERATURE MEASUREMENT
Method for the rapid temperature measurement of silver surfaces
[ISL-R-115/76] N77-33490
Temperature measurement of a cutting torch flame containing TiO2- and SiO2-particles
[ISL-R-123/76] N77-33491
Body temperature measuring system [M171]
N77-33828

TERMINAL BALLISTICS
Processing of photographical data for analysis of target deformation in terminal ballistics experiments
[ISL-CO-201/76] N77-33494

TERRAIN ANALYSIS
Martian polar geological studies
[NASA-CR-155160] N77-34069

TERRESTRIAL PLANETS
Report of the Terrestrial Bodies Science Working Group. Volume 1: Executive summary — Terrestrial planets, Galilean satellites, Comets, Asteroids, and the Moon
[NASA-CR-155189] N77-34074
Report of the Terrestrial Bodies Science Working Group. Volume 2: Mercury
[NASA-CR-155188] N77-34075
Report of the Terrestrial Bodies Science Working Group. Volume 3: Venus
[NASA-CR-155187] N77-34076
Report of the Terrestrial Bodies Science Working Group. Volume 4: The moon — lunar polar orbiter mission
[NASA-CR-155186] N77-34077
Report of the Terrestrial Bodies Science Working Group. Volume 5: Mars
[NASA-CR-155185] N77-34078
Report of the Terrestrial Bodies Science Working Group. Volume 6: The asteroids
[NASA-CR-155184] N77-34079
Report of the Terrestrial Bodies Science Working Group. Volume 7: The Galilean satellites
[NASA-CR-155183] N77-34080
Report of the Terrestrial Bodies Science Working Group. Volume 8: The comets
[NASA-CR-155181] N77-34081
Report of the Terrestrial Bodies Science Working Group. Volume 9: Complementary research and development
[NASA-CR-155181] N77-34082

TEST FACILITIES
Planning and design of additional East Mesa Geothermal Test Facilities. Phase 1B, Volume 2: Procurement package
[SAN/1140-1/2-VOL-2] N77-33657
A research program to reduce interior noise in general aviation airplanes. Design of an acoustic panel test facility
[NASA-CR-155152] N77-33957

TEXAS
Applications of remote sensing — Texas, South Dakota, North Dakota, and Kansas
[E77-10183] N77-33553
Spectral measurement of watershed coefficients in the southern Great Plains — Texas, Arizona, and New Mexico
[E77-10225] N77-33556

THEMATIC MAPPING
Seismotectonic, structural, volcanologic, and geomorphic study of New Zealand; indigenous forest assessment in New Zealand; mapping, land use and environmental studies in New Zealand, volume 3
[E77-10235] N77-33566

THERMAL CONDUCTIVITY
Density, compressibility, thermal conductivity, and mechanical movement of solid hydrazine
[AD-A042039] N77-33301
Study of underground power cable installation methods
[EPRI-EL-374] N77-33432
Heat transfer analysis for unsteady high velocity pipe flow — gun barrels
[AD-A041547] N77-33477
Effects of nuclear fusion on reaction on diffusion and thermal conduction in a magnetoplasma
[IPPJ-269] N77-33986

THERMAL CYCLING TESTS
Temperature oscillations at critical temperature in two-phase flow
[ANL-TRANS-1083] N77-33459

THERMAL DEGRADATION
The evolution and control of different performance degradation processes in modern propulsion systems -- monitoring jet engines
N77-33193

THERMAL DIFFUSION
The effect of grain size on thermal diffusion in metals
[AD-A041532] N77-33321

THERMAL EXPANSION
Properties of thermally contracting tantalum tungstate
[Y-2071] N77-33306

THERMAL INSULATION
Design report for the ACES demonstration house
[ORNL-CON-1] N77-33641

THERMAL MAPPING
Application of remote sensing in South Dakota to provide accurate inventories of agricultural crops, enhance contrast in photographic products, monitor rangeland habitat loss, map Aspen, and prepare hydrogeologic surveys
[E77-10237] N77-33568

THERMAL PLASMAS
Observation of current-driven ion sound wave in a turbulently heated plasma: The Mach 2
[IPPJ-274] N77-33989

THERMAL RESISTANCE
Risks affecting the structural resistance and integrity of modern propulsion systems
N77-33187

THERMALIZATION [ENERGY ABSORPTION]
Ratio between dynamical and thermal dissipation in turbulent flows
[AAAF-NT-77-21] N77-33472

THERMOCOUPLES
Feasibility study of thermocouple correlation type transit time flowmeter in transient steam-water flow
[TREE-NUREG-1011] N77-33489

THERMODYNAMIC EFFICIENCY
The evolution and control of different performance degradation processes in modern propulsion systems -- monitoring jet engines
N77-33193
Transpiration heat transfer in thermal energy storage devices
[PB-267281/4] N77-33616

THERMODYNAMIC EQUILIBRIUM
On the units of the equilibrium constant
[AD-A041953] N77-34028

THERMODYNAMIC PROPERTIES
Risks affecting the structural resistance and integrity of modern propulsion systems
N77-33187
Density, compressibility, thermal conductivity, and mechanical movement of solid hydrazine
[AD-A042039] N77-33301
Computer program for determining the thermodynamic properties of light hydrocarbons
[UTEC-ME-76-211] N77-33376
Optical coatings 2-6 microns — thin film deposition
[AD-A041130] N77-33971

THERMOPHYSICAL PROPERTIES
Properties of thermally contracting tantalum tungstate
[Y-2071] N77-33306

THERMOSPHERE
The energy balance of the nighttime thermosphere
[NASA-CR-155194] N77-33721

THETA PINCH
End pluggings of a linear theta pinch by hot high Z plasmas of high mass number
[IPPJ-262] N77-33979
Formation and adiabatic compression of reversed-field theta pinches in imploding liners
[AD-A041737] N77-34007

THICK FILMS
Basic adhesion mechanisms in thick and thin films
[AD-A041959] N77-33366
The effects of substrate composition on thick film circuit reliability
[AD-A041572] N77-33416

THIN FILMS
Basic adhesion mechanisms in thick and thin films
[AD-A041959] N77-33366
Thin film atomic hydrogen detectors
[NASA-CR-152605] N77-33482
Optical coatings 2-6 microns — thin film deposition
[AD-A041130] N77-33971

THREE DIMENSIONAL BOUNDARY LAYER
Experimental and theoretical investigation of three-dimensional turbulent boundary layers and turbulence characteristics inside an axial flow inducer passage
[NASA-CR-2888] N77-33106

THREE DIMENSIONAL FLOW
Three dimensional steady and unsteady asymmetric flow past wings of arbitrary planforms
[NASA-CR-145235] N77-33102
Threedimensional flow around a fixed transverse cylinder
[AAAF-NT-77-19] N77-33126
Development of a three-dimensional combustor flow analysis. Volume 3: User's manual for the MINT computer code
[AD-A041351] N77-33173
Development of a three-dimensional combustor flow analysis. Volume 2: Theoretical studies
[AD-A042122] N77-33302

THRUST AUGMENTATION
Propulsion nozzle studies. Volume 2: Design of maximum thrust nozzle-base-boattail contours
[AD-A041530] N77-33174

THRUST REVERSAL
Over-the-wing model thrust reverser noise tests
[NASA-TM-73495] N77-33161

THUNDERSTORMS
Automated prediction of thunderstorms and severe local storms
[PB-268035/3] N77-33753
Moisture distribution modification by upward vertical motion
[PB-268740/8] N77-33763
A severe storm forecast and intercept project
[PB-269485/9] N77-33773

THYRATRONS
Repetitive series interrupter II
[AD-A041144] N77-33419
Forty kilovolt megawatt average power thyratron [maps 40]
[AD-A042082] N77-33420

TIMBER INVENTORY
Application of remote sensing in South Dakota to provide accurate inventories of agricultural crops, enhance contrast in photographic products, monitor rangeland habitat loss, map Aspen, and prepare hydrogeologic surveys
[E77-10237] N77-33568

TIME DEPENDENCE
Evaluation of design safety factors for time-dependent buckling
[SAND-76-0721] N77-33547

TIME DIVISION MULTIPLEXING
Time division multiplex frame synchronization: Acquisition, maintenance and reacquisition
[AD-A041384] N77-33435

TIME LAG
Spatial correlation of transionospheric signal-time-delays
[AD-A041447] N77-33241
Estimating the lag in a nonlinear time series model
[AD-A042451] N77-33921

TIME MEASUREMENT
Time and frequency user's manual
[PB-269220/0] N77-33952

TIME SERIES ANALYSIS
An application of CP/CMS to the time series analysis
[AD-A041178] N77-33878
Estimating the lag in a nonlinear time series model
[AD-A042451] N77-33921

TIME SIGNALS
Multipath and performance tests of TRSB receivers
[AD-A041891] N77-33135

TIN ALLOYS
Power transmission project
[BNL-22202] N77-33426

TITAN CENTAUR LAUNCH VEHICLE
Propellant management report for the Titan Centaur TC-5 extended mission
[NASA-TM-73749] N77-33232

TITANIUM
The coulometric dissolution and electrochemical behavior of titanium anodes in methanol
N77-33276

TITANIUM ALLOYS
Theoretical investigation of anomalous properties of BCC, Ti, Zr, and Hf alloys
[AD-A042108] N77-33323
Investigation of metal processing operations
[AD-A042188] N77-33326
Deformation behaviour of Ti-50.3 at Ni alloy
[LBL-5103] N77-33331

TITANIUM OXIDES
Temperature measurement of a cutting torch flame containing TiO2- and SiO2-particles
[ISL-R-123/76] N77-33491

TOKAMAK FUSION REACTORS
Physics studies for TFTR
[TID-27494] N77-34010
Fusion systems engineering
[BNWL-1939-6] N77-34013

TOLUENE
Atmospheric analyzer, carbon monoxide monitor and toluene diisocyanate monitor
N77-33834

TOPOGRAPHY
Seismotectonic, structural, volcanologic, and geomorphic study of New Zealand; indigenous forest assessment in New Zealand; mapping, land use and environmental studies in New Zealand, volume 3
[E77-10235] N77-33566
LANDSAT planning applications in east central Florida
[E77-10238] N77-33569
Structural lineament and pattern analysis of Missouri, using LANDSAT imagery
[E77-10239] N77-33570
Investigation of the applications of GEOS-3 radar altimeter data in remote sensing of land and sea features
[NASA-CR-141428] N77-33577
A numerical experiment of the development of the zonally symmetric northern summer monsoon
[AD-A042103] N77-33749

TOPOLOGY
Immersion and embedding of projective varieties
N77-33906

TORCHES
Temperature measurement of a cutting torch flame containing TiO2- and SiO2-particles
[ISL-R-123/76] N77-33491

TORNADOES
Tornado detection data reduction and analysis
[NASA-CR-152595] N77-33742
Automated prediction of thunderstorms and severe local storms
[PB-268035/3] N77-33753
A severe storm forecast and intercept project
[PB-269485/9] N77-33773

TOROIDAL PLASMAS
Helically symmetric equilibrium of current-carrying finite beta plasma
[IPPJ-270] N77-33987

TOROIDS
New lens system using toroidal magnetic field for intense ion beams
[IPPJ-264] N77-33981

TOXIC HAZARDS
Development of microwave plasma detoxification process for hazardous wastes, phase
[PB-268526/1] N77-34055

TOXICITY AND SAFETY HAZARD
Preliminary assessment of relative toxicity of ethyl centralite [N, N prime-diethylcarbanilide]
[AD-A041736] N77-33371
Toxicological aspects of the Skylab program
N77-33790

TRACE CONTAMINANTS
Multidisciplinary lidar system in Spacelab for application to atmospheric physics and remote sensing — aerosols and trace gases
[ESA-TT-404] N77-33739

TRACE ELEMENTS
Description and review of global measurements of atmospheric species from GASP
[NASA-TM-73781] N77-33720

TRACKING [POSITION]
Description of laser spot motion during designation of moving targets
[AD-A041634] N77-33504
Region tracking using dynamic programming
[AD-A041908] N77-33902

TRAILING EDGES
Transonic aerodynamic characteristics of a supercritical-wing transport model with trailing-edge controls
[NASA-TM-X-3431] N77-33116
Transonic aerodynamic characteristics of a supercritical-wing transport model with trailing-edge controls, supplement, part 1
[NASA-TM-X-3431-PT-1] N77-33117
Transonic aerodynamic characteristics of a supercritical-wing transport model with trailing-edge controls
[NASA-TM-X-3431-PT-2] N77-33118

Transonic aerodynamic characteristics of a supercritical-wing transport model with trailing edge controls
[NASA-TM-X-3431-PT-3] N77-33119
Transonic aerodynamic characteristics of a supercritical-wing transport model with trailing-edge controls
[NASA-TM-X-3431-PT-4] N77-33120

TRAINING DEVICES
Investigation of diagnostic, error detector and self-taught instructional strategies for flight simulator programs
[AD-A035682] N77-33216
Investigation of card programmable and chip programmable packet calculators and calculator systems for use at Naval Post-graduate School and in the naval establishment
[AD-A041067] N77-33870

TRAJECTORY ANALYSIS
Stereoscopic direction finding analysis of a type III solar radio burst: Evidence for emission at twice the plasma frequency
[NASA-CR-155176] N77-34083

TRAJECTORY OPTIMIZATION
Mathematical model for ascent trajectory optimization of a 4-stage launch vehicle for geosynchronous missions
[ESA-TT-409] N77-33246

TRANSDUCERS
An accurate angular position and angular velocity instrument based on an optical incremental encoder
[WRE-TN-1730(WR/DI)] N77-33480

TRANSFER FUNCTIONS
Impact of a command and stability augmentation system on gust response of a combat aircraft
N77-33210

TRANSFORMATIONS [MATHEMATICS]
A study of power transforms
[AD-A041985] N77-33912
New capabilities of Walsh functions and Walsh transforms
[AD-A041748] N77-33916

TRANSISTORS
Manufacturing methods and engineering for TFT addressed display
[AD-A041754] N77-34022

TRANSMISSION CIRCUITS
Equivalent circuit representation of coupled multiwire line and its application
[MONO-24-1977] N77-33403
Modal decomposition and equivalent circuit representations of lossless coupled multiwire lines
N77-33404
Modal decomposition and equivalent circuit representations of lossy coupled multiwire lines
N77-33405

TRANSMISSION LINES
Equivalent circuit representation of coupled multiwire line and its application
[MONO-24-1977] N77-33403
Power transmission project
[BNL-22202] N77-33426
Performance of branch circuit electrical terminations of copper and aluminum non-metallic sheathed cable
[PB-267221/0] N77-33434
The effects of fast and thermal neutron flux and gamma radiation on the transmission characteristics of optical fibers
[AD-A042429] N77-33975

TRANSMITTANCE
Reciprocal acoustic transmission in a mid-ocean environment
N77-33955

TRANSMITTERS
Early performance of the 12-GHz, 200-watt transmitter experiment package in the communications technology satellite
[NASA-TM-X-3555] N77-33258

TRANSONIC FLOW
Finite-difference methods for plane steady inviscid transonic flows
[TRITA-GAD-2] N77-33109
Transonic aerodynamic characteristics of a supercritical-wing transport model with trailing-edge controls
[NASA-TM-X-3431] N77-33116
Transonic aerodynamic characteristics of a supercritical-wing transport model with trailing-edge controls, supplement, part 1
[NASA-TM-X-3431-PT-1] N77-33117
Transonic aerodynamic characteristics of a supercritical-wing transport model with trailing-edge controls
[NASA-TM-X-3431-PT-2] N77-33118
Transonic aerodynamic characteristics of a supercritical-wing transport model with trailing edge controls
[NASA-TM-X-3431-PT-3] N77-33119
Transonic aerodynamic characteristics of a supercritical-wing transport model with trailing-edge controls
[NASA-TM-X-3431-PT-4] N77-33120
Transient turbulent flow visualization by ultrafast chronophotography
[AAAF-NT-77-22] N77-33125

TRANSONIC WIND TUNNELS
Transonic wind-tunnel investigation of the maneuver potential of the NASA supercritical wing concept, phase 1
[NASA-TM-X-3534] N77-33115

TRANSPORT AIRCRAFT
Transonic aerodynamic characteristics of a supercritical-wing transport model with trailing-edge controls
[NASA-TM-X-3431] N77-33116
Transonic aerodynamic characteristics of a supercritical-wing transport model with trailing-edge controls, supplement, part 1
[NASA-TM-X-3431-PT-1] N77-33117
Transonic aerodynamic characteristics of a supercritical-wing transport model with trailing-edge controls
[NASA-TM-X-3431-PT-2] N77-33118
Transonic aerodynamic characteristics of a supercritical-wing transport model with trailing edge controls
[NASA-TM-X-3431-PT-3] N77-33119
Transonic aerodynamic characteristics of a supercritical-wing transport model with trailing-edge controls
[NASA-TM-X-3431-PT-4] N77-33120
Technical and economic assessment of swept-wing span-distributed load concepts for civil and military air cargo transports
[NASA-CR-145229] N77-33147
An evaluation of very large airplanes and alternative fuels: Executive summary
[AD-A042112] N77-33154

TRANSPORT PROPERTIES
Nonlinear heat and particle transport due to collisional drift waves
[IPPJ-281] N77-33996

TRANSPORT THEORY
Prediction of onset and development of boundary layer transition
[AAAF-NT-77-03] N77-33470

TRANSPORTATION
Energy statistics: A supplement to the summary of national transportation statistics
[PB-269301/8] N77-33672
Assessment of service requirements and design characteristics of present and future paratransit vehicles
[PB-267574/2] N77-33699

TRAPPED PARTICLES
Anomalous effect of small collisions on the nonlinear interaction in a small cold beam and a warm plasma system
[IPPJ-295] N77-34003

TRAVELING WAVE TUBES
Early performance of the 12-GHz, 200-watt transmitter experiment package in the communications technology satellite
[NASA-TM-X-3555] N77-33258
Millimeter wave gyrotron development, phase 1
[AD-A041596] N77-33415
Extended bandwidth VTS-5753B1 coupled cavity traveling wave tube
[AD-A041564] N77-33417

TRAVELING WAVES
Experimental study on self-modulation of ion plasma oscillations
[IPPJ-280] N77-33995

TRENDS
Trends in Scholarly Publishing
[BLL-BLRDR-5299-[2113.56F]]
N77-34043

TROPICAL METEOROLOGY
Meteorological forcing fields of the New York bight
[PB-269442/0] N77-33774

TROPICAL STORMS
Mariners weather log, volume 21, number 2
[PB-268219/3] N77-33755
Simulation and analysis of a tropical cyclon warning system
[AD-A042659] N77-33757
Atlantic tropical and subtropical cyclone classification for 1976
[PB-269674/8] N77-33768

TUNGSTEN
Island dissolution phase transition in a chemisorbed layer
[AD-A042444] N77-33363

TURBINE BLADES
Air bonded, FOD resistant metal matrix fan blades
[AD-A041492] N77-33170
Investigation of local damage and impulse delivered to turbine blades by normal and oblique projectile impacts
[AD-A041780] N77-33178

TURBINE ENGINES
Progress in advanced high temperature turbine materials, coatings, and technology
[NASA-TM-X-73628] N77-33159
Engine structural integrity program [ENSIP]
N77-33182
Risks affecting the structural resistance and integrity of modern propulsion systems
N77-33187

TURBINES
K-area boiler-turbine alternator. Validation tests and validation project
[BNWL-2168] N77-33653
Wind energy conversion
[PB-268718/4] N77-33667

TURBOCOMPRESSORS
Turbulent effects in axial compressors
[AAAF-NT-77-20] N77-33180
Design and development of a major engine component (compressor) for a 60 kW turbine generator set
[AD-A041717] N77-33525

TURBOFAN ENGINES
Identification and measurement of combustion noise from a turbofan engine using correlation and coherence techniques
[NASA-TM-73747] N77-33162
Measurement of far field combustion noise from a turbofan engine using coherence functions
[NASA-TM-73748] N77-33163
Output feedback regulator design for jet engine control systems
[NASA-TM-73776] N77-33165
State-of-the-art of turbofan engine noise control
[NASA-TM-73734] N77-33166
Minimum time acceleration of aircraft turbofan engines by using an algorithm based on nonlinear programming
[NASA-TM-73741] N77-33167
Pollution reduction technology program for small jet aircraft engines, phase 1
[NASA-CR-135214] N77-33168
F100 multivariable control synthesis program: Evaluation of a multivariable control using a real-time engine simulation
[NASA-TP-1056] N77-33169
CFM56 turbofan maintainability and reliability-oriented development
N77-33189
Accelerated mission test: A vital reliability tool
N77-33196

TURBOGENERATORS
Two-dimensional numerical model of the nearfield flow for an ocean thermal power plant. Part 3: Manual for the computer code NRFL02
[DSE/1005-7] N77-33623

TURBOJET ENGINES
Investigation of feasible nozzle configurations for noise reduction in turbofan and turbojet aircraft. Volume 3: Shrouded slot nozzle configurations
[AD-A041782] N77-33179
Testing simulation of damages occurred in service
N77-33194
Experimental investigation on the influence of component faults on turbojet engine performance
N77-33197

TURBULENT BOUNDARY LAYER
Experimental and theoretical investigation of three-dimensional turbulent boundary layers and turbulence characteristics inside an axial flow inducer passage
[NASA-CR-2888] N77-33106
Fundamental aerodynamic study of local injection in a turbulent boundary layer
[ESA-TT-412] N77-33127
A critical compilation of compressible turbulent boundary layer data
[AGARD-AG-223] N77-33220
Investigation of supersonic turbulent boundary-layer separation on a compression ramp by an integral method
[NASA-TM-74065] N77-33439
An experimental investigation of shock wave-turbulent boundary layer interactions with and without boundary layer suction: A data summary report
[NASA-CR-2872] N77-33440
Prediction techniques for the characteristics of fin generated three dimensional shock wave turbulent boundary layer interactions
[AD-A042024] N77-33447
Coherent structure of a turbulent boundary layer in a convected reference frame
[AD-A041751] N77-33448
Structure of a turbulent boundary layer in longitudinal equilibrium in a positive pressure gradient
[AAAF-NT-77-18] N77-33474
Effect of free stream turbulence on turbulent boundary layers in incompressible flow
[ESA-TT-411] N77-33475

TURBULENT FLOW
Transient turbulent flow visualization by ultrafast chronophotography
[AAAF-NT-77-22] N77-33125
Turbulent effects in axial compressors
[AAAF-NT-77-20] N77-33180
A critical compilation of compressible turbulent boundary layer data
[AGARD-AG-223] N77-33220
Computations in turbulent flows and off-design performance predictions for airframe-integrated scramjets
[NASA-CR-155053] N77-33438
Coherent structure of a turbulent boundary layer in a convected reference frame
[AD-A041751] N77-33448

On the large-scale structure in turbulent free shear flows
[AD-A042348] N77-33452
Numerical investigation of confined turbulent shear flows
[LBL-5582] N77-33457
Prediction of onset and development of boundary layer transition
[AAAF-NT-77-03] N77-33470
Exploratory study of turbulence in air intakes
[AAAF-NT-77-17] N77-33471
Ratio between dynamical and thermal dissipation in turbulent flows
[AAAF-NT-77-21] N77-33472
Turbulence measurements by laser anemometry
[AAAF-NT-77-07] N77-33473

TURBULENT MIXING
On the large-scale structure in turbulent free shear flows
[AD-A042348] N77-33452

TURBULENT WAKES
Threedimensional flow around a fixed transverse cylinder
[AAAF-NT-77-19] N77-33126
A flight investigation of the wake turbulence alleviation resulting from a flap configuration change on a B-747 aircraft
[NASA-TM-73263] N77-33130

TWO DIMENSIONAL FLOW
A critical compilation of compressible turbulent boundary layer data
[AGARD-AG-223] N77-33220
A numerical study of nonlinear effects on boundary-layer stability
[AD-A041088] N77-33446

TWO FLUID MODELS
Theory of two-fluid equilibrium of an axially symmetric plasma
[IPPJ-282] N77-33997

TWO PHASE FLOW
Temperature oscillations at critical temperature in two-phase flow
[ANL-TRANS-1083] N77-33459
Use of miniature optical probes in two-phase gas-liquid flow
[INEL-TR-10] N77-33460
Reservoir flow: Two-phase incompressible flow — using finite element method
[STF71-A74038] N77-33461
FLOW 22: Users's description — for 2D two phase incompressible fluid flow through porous medium
[STF71-A75003] N77-33462
Numerical solutions of the Buckley-Leverett problem
[STF71-A75024] N77-33463
Immiscible flow by finite elements
[STF71-A76017] N77-33466
Theoretical and experimental investigations on shock waves in gas-solid flows
[ILR-18] N77-33468

TYPE 3 BURSTS
Stereoscopic direction finding analysis of a type III solar radio burst: Evidence for emission at twice the plasma frequency
[NASA-CR-155176] N77-34083

U

U.S.S.R.
Translations on USSR science and technology biomedical sciences, no. 12
[JPRS-70017] N77-33844

ULTRASONIC RADIATION
Theory of ultrasonic diffraction by damage developed in thin laminated composites
[NASA-CR-155161] N77-33266
Laser interference microphone for ultrasonic recordings and nonlinear acoustic investigations
[ISL-R-132/76] N77-33493

ULTRAVIOLET RADIATION
Rocket radiation handbook. Volume 1: Rocket radiation phenomenology and theory
[AD-A042640] N77-33263
Photochemical studies of secondary nitramines. Part 2: Ultraviolet photolysis and ozonolysis of RDX in aqueous solutions
[AD-A042715] N77-33304
Method for the rapid temperature measurement of silver surfaces
[ISL-R-115/76] N77-33490
Total ozone derived from UV spectrophotometer measurements on the NASA CV-990 aircraft for the fall 1976 latitude survey flights
[NASA-CR-135276] N77-33684

ULTRAVIOLET SPECTROPHOTOMETERS
Total ozone derived from UV spectrophotometer measurements on the NASA CV-990 aircraft for the fall 1976 latitude survey flights
[NASA-CR-135276] N77-33684

UNDERGROUND EXPLOSIONS
Plate tectonics and the discrimination of underground explosions from earthquakes
[AD-A041904] N77-33729

UNDERGROUND STRUCTURES
Investigation and status report on concentric neutral corrosion of URD extruded cable
[EPRI-EL-362] N77-33327
Study of underground power cable installation methods
[EPRI-EL-374] N77-33432

UNDERWATER ACOUSTICS
Reciprocal acoustic transmission in a mid-ocean environment
N77-33955

UNDERWATER COMMUNICATION
Experimental investigation of the characteristics of Pc1 micropulsation propagation using a midlatitude five-station receiving network
[AD-A040265] N77-33392
Air/undersea communication at ultra-low-frequencies using airborne loop antennas
[AD-A042132] N77-33395

UNITED STATES OF AMERICA
Solar energy: Policy and prospects
[PB-267986/8] N77-33620
US energy flow in 1976
[UCID-17443] N77-33639
Greatest known areal storm rainfall depths for the contiguous United States
[PB-268871/1] N77-33759
Appropriate technology: A directory of activities and projects
[PB-267970/2] N77-34052

UNIVERSE
Cosmology and the structure of scientific theory
N77-34064

UNIVERSITIES
Trends in Scholarly Publishing
[BLL-BLRDR-5299-[2113.56F]]
N77-34043

UNSTEADY FLOW
Three dimensional steady and unsteady asymmetric flow past wings of arbitrary planforms
[NASA-CR-145235] N77-33102

UPGRADING
Upgrading and testing program for narrow band high resolution planetary IR imaging spectrometer
[NASA-CR-155149] N77-33969

UPPER ATMOSPHERE
Neutral atmospheric waves in the thermosphere and tropospheric weather systems
[AD-A041239] N77-33723
Positive ions in the middle atmosphere during sunrise conditions
[AD-A041799] N77-33732

URANIUM ISOTOPES
Field ionization for laser isotope separation
[EPRI-NP-334] N77-33512

URBAN PLANNING
Analytical approach to the determination of urban population density gradients and its application to energy planning problems
[BNL-20916] N77-34054
Regional data center
[PB-268883/6] N77-34056

URBAN TRANSPORTATION
Land use and arterial spacing in suburban areas
[PB-269353/9] N77-34057
Accessibility applications in urban transportation
[PB-269240/8] N77-34059

USER MANUALS [COMPUTER PROGRAMS]
NSEG: A segmented mission analysis program for low and high speed aircraft. Volume 2: Program users manual
[NASA-CR-2808] N77-33100
Development of a three-dimensional combustor flow analysis. Volume 3: User's manual for the MINT computer code
[AD-A041351] N77-33173
FLOW 22: Users's description — for 2D two phase incompressible fluid flow through porous medium
[STF71-A75003] N77-33462
GASSIM. User's description: A gas reservoir simulation model
[STF71-A76020] N77-33467
PLANS; a finite element program for nonlinear analysis of structures. Volume 2: User's manual
[NASA-CR-145244] N77-33535
User's manual: Computer-aided design programs for inductor-energy-storage dc-to-dc electronic power converters
[NASA-CR-152612] N77-33602
Two-dimensional numerical model of the nearfield flow for an ocean thermal power plant. Part 3: Manual for the computer code NRFL02
[DSE/1005-7] N77-33623
A user's guide to the System/3 data base management system [S3DBMS]
[PB-268875/2] N77-33874

USER REQUIREMENTS
Earth resources technology system standalone software package: Description and user's guide
[NASA-CR-152598] N77-33591
The division of information processing labor between user and support system: Exploration of a concept
N77-34035

UTILITIES
Application of the Alsthom/Exxon alkaline fuel cell system to utility power generation
[EPRI-EM-384] N77-33643

V

VACUUM
Development of current limiter using vacuum arc current commutation. Phase 1: A feasibility study for using arc instability in vacuum for current limitation
[EPRI-EL-393] N77-33427

VACUUM DEPOSITION
Space processing applications of ion beam technology — surface finishing, welding, milling and film deposition
[NASA-CR-135261] N77-33222
Laboratory studies of silicon vapor deposition, phase A — feasibility of producing thin films for photovoltaic applications
[NASA-CR-145236] N77-33296
Optical coatings 2-6 microns — thin film deposition
[AD-A041130] N77-33971

VACUUM MELTING
Effect of double vacuum melting and retained austenite on rolling-element fatigue life of AMS 5749 bearing steel
[NASA-TP-1060] N77-33520

VAPOR JETS
Vapor ingestion in Centaur liquid-hydrogen tank
[NASA-TP-1061] N77-33444

VAPOR PHASES
Laboratory studies of silicon vapor deposition, phase A — feasibility of producing thin films for photovoltaic applications
[NASA-CR-145236] N77-33296

VAPOR TRAPS
Reliability study of vapor recovery systems at service stations
[PB-267613/8] N77-33700

VAPORIZING
Ice in space: An experimental and theoretical investigation
[NASA-CR-150417] N77-34067

VARIATIONAL PRINCIPLES
Theory of two-fluid equilibrium of an axially symmetric plasma
[IPPJ-282] N77-33997

VECTOR ANALYSIS
On the average number of maxima in a set of vectors and applications
[AD-A042597] N77-33918

VECTOR SPACES
Generic bifurcation with application to the von Karman equations
N77-33905
Periodic rings
N77-33947

VECTORCARDIOGRAPHY
Vectorcardiographic results from Skylab medical experiment M092: Lower body negative pressure
N77-33810
Vectorcardiographic changes during extended space flight [M093]: Observations at rest and during exercise
N77-33813
Vectorcardiograph
N77-33824

VECTORS [MATHEMATICS]
Testing significance of a mean vector: A possible alternative to Hotellings T squared
[AD-A042644] N77-33920

VEGETATION
Applied Remote Sensing Program [ARSP] — Apache, Yavapai, Graham, and Yuma countries, Arizona
[E77-10240] N77-33571
Investigation of environmental change pattern in Japan. Investigation of the ecological environment index from observation of the regional vegetation cover and their growing condition
[E77-10244] N77-33575
An analysis on vegetation cover by using LANDSAT MSS data
[E77-10245] N77-33576
Discrete event approach to pollutant transport and vegetation effects
[ORNL-CSD-TM-11] N77-33694

VELOCITY
Exploratory study of turbulence in air intakes
[AAAF-NT-77-17] N77-33471

VELOCITY DISTRIBUTION
Mass spectrometric measurement of velocity distributions of nitrogen molecules in the expansion gas of lead azide after ultrahigh vacuum detonation
[ISL-R-108/76] N77-33308

VELOCITY MEASUREMENT
Demonstration of rapid-scan two-dimensional laser velocimetry in the Langley Vortex Research Facility for research in aerial applications
[NASA-TM-74081] N77-33497

VENUS [PLANET]
Report of the Terrestrial Bodies Science Working Group. Volume 3: Venus
[NASA-CR-155187] N77-34076
VERTICAL AIR CURRENTS
Moisture distribution modification by upward vertical motion
[PB-268740/8] N77-33763
VESTIBULAR TESTS
Vestibular-visual interactions in flight simulators
[NASA-CR-155200] N77-33847
VESTIBULES
Experiment M131. Human vestibular function
N77-33791
VHF OMNIRANGE NAVIGATION
Monte Carlo simulation of VOR/DME holding procedures. Basic notions and applications
[ESA-TT-419] N77-33142
VIBRATION DAMPING
Design and development of a structural mode control system
[NASA-CR-143846] N77-33201
Structural Aspects of Active Controls
[AGARD-CP-228] N77-33208
Active flutter suppression of an airplane with wing mounted external stores
N77-33211
Wind tunnel study of an active flutter suppression system
N77-33215
VIBRATION ISOLATORS
Steady-state unbalance response of a three-disk flexible rotor on flexible, damped supports
[NASA-TM-X-73666] N77-33160
VIBRATION TESTS
Shuttle payload vibroacoustic test plan evaluation. Free flyer payload applications and sortie payload parametric variations
[NASA-CR-152594] N77-33250
VIBRATIONAL SPECTRA
The integrated infrared intensities of the fundamental vibrations of acetylene, acetylene d2 and effective charges
N77-33280
Raman spectra of molecules with anharmonic vibrations in the gaseous and solid phases
N77-33287
VIDEO DATA
Communication system analysis for manned space flight
[NASA-CR-151508] N77-33388
VIKING MARS PROGRAM
Tracking and data system support for the Viking 1975 mission to Mars. Volume 3: Planetary operations
[NASA-CR-155168] N77-33229
VIKING ORBITER SPACECRAFT
Calibration of Viking imaging system pointing, image extraction, and optical navigation measure
[NASA-CR-155165] N77-33235
VISCOELASTICITY
Viscoelastic properties of homogeneous block copolymers
[AD-A042044] N77-33361
Dynamical shear and structural viscoelasticity in elastohydrodynamic lubrication
[AD-A041665] N77-33365
VISCOSITY
High pressure and temperature effects on the viscosity, density and bulk modulus of two liquid lubricants
[AD-A041902] N77-33364
VISCOUS FLUIDS
Efficiency of particle removal from viscous liquids with a hydroclone
[ORNL-MIT-237] N77-33458
VISIBILITY
The maximum detection range and the maximum recognition distance when observing ground targets from helicopters
[DLR-IB-553-76/3] N77-33861
Some test results on the visibility of obstacle and hazard beacons
[DLR-IB-553-76/5] N77-33862
VISUAL OBSERVATION
Transparent materials processing system
[NASA-CR-150411] N77-33516
Visual light flash observations on Skylab 4
N77-33794
The maximum detection range and the maximum recognition distance when observing ground targets from helicopters
[DLR-IB-553-76/3] N77-33861
VISUAL PERCEPTION
Effects of visual propioceptive cue conflicts on human tracking performance
[AD-A042006] N77-33860
Some test results on the visibility of obstacle and hazard beacons
[DLR-IB-553-76/5] N77-33862
VOICE COMMUNICATION
Air traffic control experimentation and evaluation test
[AD-A041971] N77-33136
VOID RATIO
Shock wave attenuation by perforated plates with various hole sizes
[AD-A041854] N77-33449
VOLCANOLOGY
Seismotectonic, structural, volcanologic, and geomorphic study of New Zealand; indigenous forest assessment in New Zealand; mapping, land use, and environmental studies in New Zealand, volume 1
[E77-10233] N77-33564
VOLTAGE CONVERTERS [DC TO DC]
User's manual: Computer-aided design programs for inductor-energy-storage dc-to-dc electronic power converters
[NASA-CR-152612] N77-33602
VON KARMAN EQUATION
Generic bifurcation with application to the von Karman equations
N77-33905
VORTICES
Vortex interactions and decay in aircraft wakes
[NASA-CR-2870] N77-33105
Threedimensional flow around a fixed transverse cylinder
[AAAF-NT-77-19] N77-33126
Demonstration of rapid-scan two-dimensional laser velocimetry in the Langley Vortex Research Facility for research in aerial applications
[NASA-TM-74081] N77-33497
Significant applications of LANDSAT-2 MSS data to marine environment — Japanese coastal areas
[E77-10229] N77-33560
Spiral-like auroral forms: Observations and a proposed theory
N77-33713
VOYAGER PROJECT
Voyager: Journey to the outer planets
[NASA-CR-155147] N77-33233
VULNERABILITY
Physical vulnerability of aircraft due to fluid dynamic effects
[AGARD-AR-106] N77-33478

W

WALL FLOW
Ratio between dynamical and thermal dissipation in turbulent flows
[AAAF-NT-77-21] N77-33472
WALSH FUNCTION
New capabilities of Walsh functions and Walsh transforms
[AD-A041748] N77-33916
WARNING SYSTEMS
Simulation and analysis of a tropical cyclon warning system
[AD-A042659] N77-33757
A severe storm forecast and intercept project
[PB-269485/9] N77-33773
WASHING
Wash water waste pretreatment system
[NASA-CR-151513] N77-34048
WASHINGTON
K-area boiler-turbine alternator. Validation tests and validation project
[BNWL-2168] N77-33653
WASTE DISPOSAL
A summary of the test procedures and operational details of an ocean dumping pollution monitoring experiment conducted 7 October 1976
[NASA-TM-74066] N77-33579
Preliminary design study of a baseline MIUS
[NASA-TM-X-58193] N77-34050
Procedures manual for ground water monitoring at solid waste disposal facilities
[EPA-530/SW-611] N77-34051
Evaluation of the disposal of flue gas desulfurization wastes in mines and the ocean: Initial assessment
[PB-269270/5] N77-34058
WASTE ENERGY UTILIZATION
Preliminary design study of a baseline MIUS
[NASA-TM-X-58193] N77-34050
WASTE WATER
Wash water waste pretreatment system
[NASA-CR-151513] N77-34048
WASTES
The economic determinants of waste oil recycling
N77-33597
WATER
Corrosion behavior of aluminum in water
[Y-DA-7055] N77-33334
A finite element model for the analysis of waterflood performance
[STF71-A75036] N77-33464
WFLOOD: Users's description. A simulation model for oil reservoirs subjected to waterflooding — based on finite element method
[STF71-A76005] N77-33465
WATER CONSUMPTION
Problems affecting usefulness of the national water assessment: Water resources council
[PB-269257/2] N77-33594
WATER CURRENTS
General pattern of the turbid water in the Seto-inland sea extracted from multispectral imageries by the LANDSAT-1 and 2
[E77-10230] N77-33561
WATER FLOW
Feasibility study of thermocouple correlation type transit time flowmeter in transient steam-water flow
[TREE-NUREG-1011] N77-33489
General pattern of the turbid water in the Seto-inland sea extracted from multispectral imageries by the LANDSAT-1 and 2
[E77-10230] N77-33561
WATER POLLUTION
Investigation of environmental change pattern in Japan. Utilization of LANDSAT-2 data for fisheries
[E77-10227] N77-33558
Application of LANDSAT MSS data to the study of oceanographical environment — Seto Inland Sea
[E77-10228] N77-33559
Significant applications of LANDSAT-2 MSS data to marine environment — Japanese coastal areas
[E77-10229] N77-33560
General pattern of the turbid water in the Seto-inland sea extracted from multispectral imageries by the LANDSAT-1 and 2
[E77-10230] N77-33561
Effects of economic development on water resources
[PB-269096/4] N77-33593
Review of current interest and research in water hyacinth-based wastewater treatment
[NASA-CR-155150] N77-33683
Behavior of mercury, chromium, and cadmium in aquatic systems
[PB-267559/3] N77-33687
Suspended and dissolved solids effects on freshwater biota: A review
[PB-269180/6] N77-33707
Economic impact of proposed amendment to water pollution regulations for hexane extractable materials, R74-1, 8, 9
[PB-269184/8] N77-33709
Bachman treatment facility for excessive storm flow in sanitary sewers
[PB-269128/5] N77-34060
WATER RESOURCES
Effects of economic development on water resources
[PB-269096/4] N77-33593
Problems affecting usefulness of the national water assessment: Water resources council
[PB-269257/2] N77-33594
Predicting changes in land-use patterns resulting from water resource investment using a nonstationary Markov process
[PB-269409/9] N77-33595
Energy technologies for the west: Possible effects of Energy Technology on Land, Water, and Air Resources
[TID-27444] N77-33632
WATER TREATMENT
Review of current interest and research in water hyacinth-based wastewater treatment
[NASA-CR-155150] N77-33683
Wash water waste pretreatment system
[NASA-CR-151513] N77-34048
WATER VAPOR
A polynomial representation of 6-3 micrometers water vapor and 4.3 micrometers CO2 atmospheric transmissivities
[PB-267593/2] N77-33973
WATER WAVES
Stereophotogrammetric reconnaissance of ocean wave/sea ice interaction
N77-33552
Design of an electrohydraulic wave follower system
[AD-A042317] N77-33778
WATERSHEDS
Spectral measurement of watershed coefficients in the southern Great Plains — Texas, Arizona, and New Mexico
[E77-10225] N77-33556
WAVE DEGRADATION
Theoretical seismograms of code phases calculated by a frequency-dependent full wave theory, and their interpretation
N77-33715
Parametric decay of lower hybrid wave into drift waves
[IPPJ-272] N77-33988
WAVE DIFFRACTION
Theory of ultrasonic diffraction by damage developed in thin laminated composites
[NASA-CR-155161] N77-33266
The theory of diffraction by a perfectly conducting wedge of arbitrary angle applied to antenna patterns
[ESA-TT-416] N77-33401
WAVE DISPERSION
Contribution of higher order terms in the reductive perturbation theory. 2: A case of strongly dispersive wave
[IPPJ-277] N77-33992

WAVE EQUATIONS
Parametric decay of lower hybrid wave into drift waves
[IPPJ-272] N77-33988

WAVE EXCITATION
Particle simulation on the propagation and plasma heating of the lower hybrid wave in the nonuniform system
[IPPJ-296] N77-34004

WAVE FRONT RECONSTRUCTION
Reconstruction of a source from a few [2 or 3] projections
[LA-6747-MS] N77-33976

WAVE FUNCTIONS
Investigations on approximate quantum mechanical wave functions for first period atoms and molecules N77-33964

WAVE INTERACTION
Ionosphere/microwave beam interaction study — satellite solar energy conversion
[NASA-CR-151517] N77-33389

WAVE PACKETS
Theory for space-time evolution of explosive-type instability
[IPPJ-276] N77-33991

WAVE PROPAGATION
Nonlinear propagation of the ordinary mode in a hot magnetoplasma
[IPPJ-265] N77-33982
The nonlinear distortion of propagation cones of lower hybrid wave in an inhomogeneous plasma
[IPPJ-268] N77-33985
Contribution of higher order terms in the reductive perturbation theory. 2: A case of strongly dispersive wave
[IPPJ-277] N77-33992
Propagation of nonlinear ion acoustic wave with generation of long-wavelength waves
[IPPJ-297] N77-34005

WAVE SCATTERING
Stereophotogrammetric reconnaissance of ocean wave/sea ice interaction N77-33552

WAVELENGTHS
Solid-state laser wavelength identification using a reference absorber
[AD-A041689] N77-33503

WEAPON SYSTEMS
Aggregated shorads attrition weapon deck — subroutine libraries [computers]
[AD-A040390] N77-33242

WEAPONS INDUSTRY
Major system acquisition: Is a separate spares contract better
[AD-A042775] N77-34033

WEATHER
Mariners weather log, volume 21, number 2
[PB-268219/3] N77-33755

WEATHER FORECASTING
Tornado detection data reduction and analysis
[NASA-CR-152595] N77-33742
A simulated mission success indicator for use with probability forecasts at Travis AFB, California
[AD-A041880] N77-33751
Automated prediction of thunderstorms and severe local storms
[PB-268035/3] N77-33753
Operations of the National Weather Service
[PB-268041/1] N77-33754
An examination of probability of precipitation forecasts in light of rainfall areal coverage
[PB-268761/4] N77-33758
Computer software for the assessment of growth histories of weather radar echoes
[PB-268753/1] N77-33764
A severe storm forecast and intercept project
[PB-269485/9] N77-33773
Weather forecasting and weather forecasts: Models, systems and users. Volume 2: Notes from a colloquium
[PB-268914/9] N77-33775
Weather forecasting and weather forecasts: Models, systems, and users. Volume 1: Notes from a colloquium
[PB-268913/1] N77-33776

WEATHER MODIFICATION
Changes in the composition of the atmosphere and their impact upon climatic variability: An overview
[BMA-24] N77-33761

WEATHERING
Preliminary studies of the alteration of a granite by an artificial hydrothermal system
[LA-6696-MS] N77-33735

WEDGES
The theory of diffraction by a perfectly conducting wedge of arbitrary angle applied to antenna patterns
[ESA-TT-416] N77-33401

WEIBULL DENSITY FUNCTIONS
A Weibull characterization for tensile fracture of multicomponent brittle fibers
[NASA-TM-73790] N77-33929

WEIGHT INDICATORS
Physiological mass measurements in Skylab N77-33799

WEIGHTLESSNESS
Biomedical results from Skylab
[NASA-SP-377] N77-33780
Skylab 2 crew observations and summary N77-33784
Task and work performance on Skylab missions 2, 3, and 4: Time and motion study: Experiment M151 N77-33796
Crew efficiency on first exposure to zero-gravity N77-33797
Physiological mass measurements in Skylab N77-33799
The response of single human bells to zero-gravity N77-33805
Lower body negative pressure: Third manned Skylab mission N77-33809
Vectorcardiographic results from Skylab medical experiment M092: Lower body negative pressure N77-33810
Hemodynamic studies of the legs under weightlessness N77-33811
Anthropometric changes and fluid shifts N77-33812
Vectorcardiographic changes during extended space flight [M093]: Observations at rest and during exercise N77-33813
Evaluation of the electromechanical properties of the cardiovascular system after prolonged weightlessness N77-33814
Effect of prolonged space flight on cardiac function and dimensions N77-33815
Results of Skylab medical experiment M171-metabolic activity N77-33816
Lower body negative pressure device N77-33821
Vectorcardiograph N77-33824
Body temperature measuring system [M171] N77-33828

WELDING
Space processing applications of ion beam technology — surface finishing, welding, milling and film deposition
[NASA-CR-135261] N77-33222

WETLANDS
Application of LANDSAT imagery in land use inventory and classification in Nebraska — Lower and Upper Niobrara area and Sheridan County
[E77-10242] N77-33573

WHEAT
Applications of remote sensing — Texas, South Dakota, North Dakota, and Kansas
[E77-10183] N77-33553

WILDLIFE
Application of remote sensing technology to the solution of problems in the management of resources in Indiana
[E77-10223] N77-33554

WIND [METEOROLOGY]
Neutral atmospheric waves in the thermosphere and tropospheric weather systems
[AD-A041239] N77-33723
The 12817A Lance missile number 4106, round number 295 RCL
[AD-A041448] N77-33744
The 12815C Lance missile number 4043, round number 294 RSL
[AD-A041453] N77-33745
The 17901AT Honest John missile numbers 1483/1494 round numbers 656 ASL/658 ASL
[AD-A041449] N77-33746

WIND PRESSURE
Wind load requirements for buildings
[PB-268547/7] N77-33385

WIND TUNNEL TESTS
A survey of transition research at AEDC
[AD-A041740] N77-33219
Results of a landing gear loads test using a 0.0405-scale model [16-0] of the space shuttle orbiter in the Rockwell International NAAL wind tunnel [OA163B], volume 1
[NASA-CR-151370] N77-33253
Results of a landing gear loads test using a 0.0405-scale model [16-0] of the space shuttle orbiter in the Rockwell International NAAL wind tunnel [OA163B], volume 2
[NASA-CR-151371] N77-33254

WIND TUNNELS
Structure of a turbulent boundary layer in longitudinal equilibrium in a positive pressure gradient
[AAAF-NT-77-18] N77-33474

WINDMILLS [WINDPOWERED MACHINES]
Optimization and characteristics of a Sailwing windmill rotor
[NSF/RANN/GI-41891/FR/75/4] N77-33652

WINDOWS [APERTURES]
Window design strategies to conserve energy
[PB-269297/8] N77-33669

WINDPOWER UTILIZATION
Optimization and characteristics of a Sailwing windmill rotor
[NSF/RANN/GI-41891/FR/75/4] N77-33652
Wind energy conversion
[PB-268718/4] N77-33667

WING LOADING
Wing rock as a lateral-directional aircraft limit cycle oscillation induced by nonlinear aerodynamics occurring at high angle of attack
[AD-A042104] N77-33204

WING OSCILLATIONS
Wind tunnel study of an active flutter suppression system N77-33215

WING TANKS
Active flutter suppression of an airplane with wing mounted external stores N77-33211

WING TIPS
Theoretical parametric study of the relative advantages of winglets and wing-tip extensions
[NASA-TP-1020] N77-33112

WINGLETS
Theoretical parametric study of the relative advantages of winglets and wing-tip extensions
[NASA-TP-1020] N77-33112

WINGS
Evaluation of composite wing for XFV-12A airplane
[AD-A041208] N77-33152
Acoustic emission monitoring of crack propagation on the expedited wing fatigue test article X993
[AD-A041107] N77-33540

WIRE
Analysis of wire antennas in the presence of a conducting half space. Part 3: The buried antenna
[UCRL-52228] N77-33400

WIRE CLOTH
Study of liquid jet impingement on screens
[NASA-CR-135260] N77-33437

X

X RAY ANALYSIS
Automated chest X-ray analysis
[LA-UR-77-532] N77-33851

X RAY DIFFRACTION
Structure analyses of several organic compounds using X-ray crystallographic techniques N77-33286

X RAY SCATTERING
Small-angle X-ray and small-angle light scattering studies of the morphology of polymer blends N77-33342

X RAY SOURCES
The X-ray emitting galaxy Cen-A
[NASA-TM-X-71402] N77-34092

X RAY SPECTRA
Calculations of soft auroral bremsstrahlung and K alpha line emission at satellite altitude
[AD-A041599] N77-33727
The X-ray emitting galaxy Cen-A
[NASA-TM-X-71402] N77-34092

X RAY SPECTROSCOPY
X-Ray photoelectron spectroscopy study of radiofrequency-sputtered titanium, carbide, molybdenum carbide, and titanium boride coatings and their friction properties
[NASA-TP-1033] N77-33348

X RAYS
Coupling of X-ray deposition structural response
[AD-A042667] N77-33544

XENON LAMPS
Manufacturing methods and technology [MMTE] measure for fabrication of low voltage start sealed beam arc lamps
[AD-A041517] N77-33414

Y

YAG LASERS
Solid-state laser wavelength identification using a reference absorber
[AD-A041689] N77-33503

Z

ZINC ALLOYS
Mechanism of stress-corrosion cracking
[AD-A042106] N77-33322

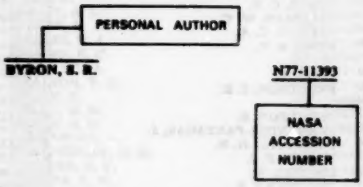
ZINC SELENIDES
Development of low-cost hardened zinc selenide for IR windows
[AD-A042147] N77-33974

ZIRCONATES
Lead zirconate titanate [lzt] ceramics
[AD-A041507] N77-33360

ZIRCONIUM ALLOYS
Theoretical investigation of anomalous properties of BCC, Ti, Zr, and Hf alloys
[AD-A042108] **N77-33323**

PERSONAL AUTHOR INDEX

Typical Personal Author Index Listing



Listings in this Index are arranged alphabetically by personal author. The NASA accession number denotes the number by which the citation is identified.

A

ABE, H. N77-34003
N77-34004
ABELL, E. E. N77-33182
ABU-ALSAMH, R. A. N77-34032
ACHTERMANN, E. N77-33739
ADAMS, C. N. N77-33443
ADAMS, J. W. N77-33705
ADAMS, R. N77-33699
ADAMSON, A. W. N77-33966
ADEY, W. R. N77-33849
AFIFI, M. N77-33251
AGGARWAL, J. K. N77-33901
AGUER, J. A. N77-33187
AKAI, J. A. N77-33294
ALBEE, A. L. N77-34075
N77-34078
ALBERTS, J. J. N77-33687
ALLCOCK, H. R. N77-33368
ALLEN, C. C. N77-33251
ALLMAN, J. G. N77-33174
ALPER, A. N77-33452
ALTHOUSE, E. L. N77-33392
AMAGISHI, Y. N77-33989
AMSTUTZ, D. E. N77-33552
ANAND, A. K. N77-33106
ANDERSON, J. R. N77-33930
ANDERSON, R. G. N77-33693
ANDRAWIS, A. S. N77-33568
ANDREZEN, A. B. N77-33428
ANKENEY, D. B. N77-33478
ANSTAUGH, B. E. N77-33604
AONO, O. N77-33986
ARDONCEAU, P. N77-33473
ARENDT, R. H. N77-33360
ARENTS, D. N. N77-33155
ARMEN, H., JR. N77-33535
ARMSTRONG, G. C. N77-33218
ARMSTRONG, G. T. N77-33370
ARNAL, D. N77-33475
ARNAUDON, J. F. N77-33471
ARNOLD, F. E. N77-33355
ARPPA, K. N77-33121
ASCENZI, D. M. N77-33367
ASH, W. L. N77-33880
ASHBY, G. C., JR. N77-33236
ASHER, R. B. N77-33897
ATTA, E. H. N77-33102
AULINGER, F. N77-33308
AULT, G. M. N77-33159
AUSTIN, D. M. N77-33894
AUSTIN, J. N77-33158
AVANESOV, G. A. N77-33583
AYERS, T. G. N77-33115
AYOUB, M. M. N77-33857
AYRES, C. L. N77-33237

B

BACH, W. N77-33761
BAHR, A. J. N77-33397
BAILEY, C. D. N77-33540
BAILEY, J. V. N77-33789
N77-33794
BAILEY, T. T. N77-33951
BAILIN, L. J. N77-34055
BAJORINAS, L. N77-33144
BAKER, J. T. N77-33795
BALAGNA, J. N77-33735
BALCERSKI, J. S. N77-33336
BALLARD, H. N. N77-33725
BALON, J. E. N77-33683
BALZER, R. N77-33879
BANNOCHIE, J. G. N77-33643
BARBER, J. P. N77-33178
BAREISS, L. E. N77-33248
BARIO, F. N77-33474
BARR, D. R. N77-33722
BARRETT, C. A. N77-33316
BARRETT, R. J. N77-33646
BARROWS, R. G. N77-33929
BARRY, M. R. N77-33909
BARZILY, Z. N77-33940
BATES, L. W. N77-33709
BATSON, G. B. N77-33539
BAUM, B. N77-33347
BAUMBACK, M. M. N77-34083
BAUMGARTNER, A. J. N77-33264
BAUMGARTNER, W. E. N77-33153
BEACH, C. J. N77-33718
BEARMAN, T. C. N77-34036
BECK, R. N77-33739
BECK, T. R. N77-33317
BECKER, M. N77-33646
BECKER, R. H. N77-34092
BECKMAN, J. C. N77-34080
BEKBER, A. H. N77-33346
BEGGS, J. A. N77-33515
BEGOVICH, C. L. N77-33592
BEGUIER, C. N77-33472
BEHANNON, K. W. N77-34068
N77-34091
N77-34088
BELL, B. N77-33347
BELL, J. A. N77-33414
BELL, T. N77-33643
BELLOWS, R. J. N77-33620
BEN-DAVID, S. N77-33640
BENDOV, Y. N77-33135
BENEKE, J. N77-33640
BENENSON, P. N77-33583
BENILOV, Y. M. N77-33674
BENINGTON, H. N77-33875
BENJAUTHRIT, B. N77-33578
BENSKO, J., JR. N77-33501
BENTLEY, H. T., III N77-33918
BENTLEY, J. L. N77-33149
BERG, R. A. N77-33656
BERG, R. S. N77-33917
BERGER, R. L. N77-33809
BERGMAN, S. A., JR. N77-33810
N77-33814
N77-33171
BERKER, D. N77-33604
BERMAN, P. A. N77-34041
BERMAN, P. I. N77-33874
BERMAN, W. J. N77-33457
BERNARD, P. S. N77-33369
BERNIER, G. W. N77-33568
BEST, R. G. N77-33310
BHAT, G. R. N77-33105
BILANIN, A. J. N77-33895
BINFORD, T. O. N77-33686
BISHOP, D. E. N77-33706
BISHOP, J. M. N77-33307
BISWAS, S. S. N77-33830
BLACKBURN, C. M. N77-33873
BLAIR, M. N77-33727
BLAKE, J. B. N77-33556
BLANCHARD, B. J. N77-34070
BLASIUS, K. R. N77-34073
N77-33101
BLEWITT, S. J. N77-33357
BLOCK, B. P. N77-33310
BLOCK, I. N77-33880
BOBROW, R. J. N77-33363
BODNER, S. R. N77-33376
BOEHM, R. F. N77-33654
BOES, E. C.

BOLDT, E. A. N77-34092
BOLSHOY, A. A. N77-33583
BOMAR, B. W. N77-33501
BOOHER, C. R. N77-33793
N77-33829
BOOK, D. L. N77-34006
N77-34007
BOOS, D. D. N77-33935
N77-33936
BOWMAN, J. S., JR. N77-33111
BRADEN, R. T. N77-33871
N77-33881
BRAIDS, O. N77-34051
BRAINARD, W. A. N77-33348
BRANDT, J. C. N77-34081
BRAUN, E. N77-33309
BRAUN, R. L. N77-33381
N77-33382
BRAUSCH, J. F. N77-33177
BRAYTON, R. K. N77-33924
BRECKENRIDGE, W. G. N77-33235
BRENNER, I. S. N77-33763
BREVI, R. N77-33459
BRIEHL, D. N77-33720
BRIGGS, F. A. N77-33872
BRIGGS, G. N77-34078
BROCKETT, R. M. N77-33788
BROWN, D. N77-33813
BROWN, J. J. N77-33448
BROWN, J. W. N77-34037
BROWN, L. R. N77-33786
BROWN, R. L. N77-33941
BRUCE, T. W. N77-33168
BRYAN, R. J. N77-33700
BUBE, K. R. N77-33366
BUBENIK, D. M. N77-33395
BUCKLER, A. T. N77-33856
BUCKLEY, D. H. N77-33350
BUDERER, M. C. N77-33816
BUELL, R. H. N77-33861
N77-33862
BULLOCK, M. G. N77-33384
BULUSU, S. N77-33304
BURCHILL, R. F. N77-33479
BURK, S. M., JR. N77-33111
BURKETT, H. A. N77-33870
BURLAGA, L. F. N77-34091
BURRUS, B. M. N77-33510
BURTSEV, V. A. N77-33428
N77-33429
BUTLER, M. L. N77-33261
BYRNE, G. D. N77-33925

C

CAGLAYAN, A. K. N77-33200
CALAHAN, D. A. N77-33883
CAMBANIS, S. N77-33934
CAME, P. M. N77-33172
CAMP, R. T., JR. N77-33961
CANDE, S. C. N77-33716
CANNON, M. W., JR. N77-33859
CANNON, S. E. N77-33396
CARLSON, D. N. N77-33202
CARLSON, M. P. N77-33573
CARTER, R. G. N77-33267
CARTER, W. C. N77-33358
CASTANON, D. R. N77-33496
CATHCART, J. V. N77-33333
CESARONE, R. J. N77-33454
CHALK, C. R. N77-33217
CHAMMAS, A. B. N77-33903
CHAMPION, F. C. N77-33496
CHAN, E. N77-33414
CHAN, E. L. N77-33496
CHAN, P. N77-33640
CHANG, E. T. N77-33301
CHANG, J. C. N77-33496
CHANG, L. C. N77-33476
CHANG, L. F. W. N77-33772
CHAPMAN, C. R. N77-34079
N77-34080
N77-34081
CHAPMAN, P. K. N77-33226
CHARNAY, G. N77-33474

CHASSAY, C. N77-33832
CHEN, C. J. N77-33477
CHEN, W. C. N77-33314
CHENG, D. K. N77-33916
CHESNOKOV, Y. M. N77-33583
CHETAIL, P. N77-33193
CHILDS, M. E. N77-33440
CHIOU, J. S. N77-33477
CHMIEL, C. T. N77-33369
CHON, C. T. N77-33543
CHOPRA, I. N77-33667
CHOY, G. L. N77-33715
CHRUSCIEL, W. A. N77-33458
CHU, W. W. N77-33591
CHUBB, G. P. N77-33900
CHUEH, K. R. S. N77-33908
CHUNG, S. Y. N77-33667
CINI, R. N77-34020
CIPRIOS, G. N77-33608
N77-33609
CLAPPER, W. S. N77-33175
CLARK, B. N77-33847
CLARK, E. J. N77-33434
CLARK, E. L., JR. N77-33927
CLARK, T. A. N77-33588
CLAYTON, K. I. N77-33152
CLEAR, R. N77-33640
COATES, R. N77-33588
COCHRAN, J. R. N77-33777
COCKING, B. J. N77-33176
COCOZZA, E. N77-34051
COFFEY, H. E. N77-34090
COHEN, J. B. N77-33484
N77-33542
N77-33913
COHEN, J. S. N77-33372
COHEN, L. M. N77-33644
COHN, S. N77-33210
COLAMARINO, P. N77-34020
COLLMANN, K. D. N77-33251
CONDON, G. P. N77-33900
CONNELLY, E. M. N77-33376
COOK, D. S. N77-33805
COOK, J. E. N77-33673
COOKE, P. W. N77-34058
COOPER, C. B. N77-33644
COPE, J. N77-33293
COPELAND, T. G. N77-33490
COQUERELLE, P. N77-33588
COREY, B. E. N77-34075
CORONITI, F. V. N77-34080
N77-33643
CORREA, J. H. N77-33824
COSTELLO, M. J. N77-33756
COTTON, W. R. N77-33762
N77-33541
COUGHLIN, J. P. N77-33449
COULTER, G. N77-33588
COUNSELMAN, C. C. N77-33375
COX, F. W. N77-33740
COX, S. K. N77-33973
N77-33245
CRAEMER, W. N77-33766
CRAM, R. S. N77-33695
CRAVEN, C. W., JR. N77-33766
CRAYTON, R. B. N77-33770
N77-33669
CRENSHAW, R. W. N77-33398
CROISANT, W. J. N77-33975
N77-33381
CRONIN, R. H. N77-33382
N77-33854
CRONRATH, D. N77-33773
CROWTHER, H. N77-34022
CSAKVARY, T. N77-33292
CULLICK, A. S. N77-33924
CULLUM, J. N77-33593
CULLUM, J. H. N77-33459
CUMO, M. N77-33769
CUNNING, J. B. N77-33160
CUNNINGHAM, R. E. N77-34069
CUTTS, J. A. J. N77-34073
N77-33802
CUZZI, J. N77-33169
CWYNAR, D. S. N77-33439
CZARNECKI, K. R.

D

DAHL, P. R. N77-33528
DAHLSTROM, B. N77-34056
DALEN, V. N77-33461
N77-33462
N77-33463
N77-33464
N77-33465
N77-33466
N77-33467
DALEY, M. N77-33778
DALSTED, K. J. N77-33568
DAMM, C. C. N77-34012
DANIEL, I. M. N77-33268
DANIELS, J. L. N77-33578
DAREE, K. N77-33514
DAVENPORT, C. M. N77-33529
DAVID, M. N77-34059
DAVID, N. A. N77-33381
N77-33382
DAVIDSON, M. N77-33655
DAVIES, D. H. N77-34022
DAVIS, D. R. N77-33702
N77-34073
DAVIS, F. G. N77-33168
DAVIS, J. A. N77-33320
N77-33324
DAVIS, J. R. N77-33392
DAVIS, K. B. N77-33391
DAVISSON, L. D. N77-33742
DEADMORE, D. N77-33313
DEADRICK, F. J. N77-33400
DEAN, A. M. N77-33299
DEEG, H. J. N77-33468
DEFONTAINE, D. N77-33323
DEFOREST, S. E. N77-33244
DEKA, B. K. N77-33500
DEKEYSER, I. N77-33472
DELENE, J. G. N77-33968
DELHAYE, J. M. N77-33460
DELIONBACK, L. M. N77-34044
DELOREY, D. E. N77-33243
DEMARTEAU, S. K. W. J. N77-33186
DEPILLIS, J. N77-33914
DERICKSON, R. G. N77-33762
DERMAN, D. N77-33363
DESTUYNDER, R. N77-33215
DEVOGE, B. N77-33195
DEY, A. N. N77-33611
DICKSON, C. R. N77-33291
DIETLEIN, L. F. N77-33780
N77-33820
N77-33194
DINI, D. N77-33694
DIXON, K. R. N77-33170
DOBLE, G. S. N77-33437
DODGE, F. T. N77-33797
DOERRE, G. L. N77-33974
DONADIO, R. N77-33757
DONOHOE, A. J. N77-33332
DORAN, D. G. N77-33219
DOUGHERTY, N. S., JR. N77-33689
DOUGLAS, G. W. N77-33578
DOWNS, S. W., JR. N77-33329
DRAPER, V. F. N77-33616
DRESSLER, W. E. N77-33806
DRISCOLL, T. B. N77-33595
DRUMMOND, H. E. N77-33428
DUBANSKII, V. A. N77-33429
N77-33453
DUCK, P. W. N77-33702
DUCKSTEIN, L. N77-33567
DUDAL, R. J. N77-33246
DUFFEK, W. N77-33950
DUGOPOLSKI, M. J. N77-33667
DUGUNDJI, J. N77-34077
DUKE, M. B. N77-34078
N77-33137
DUMAS, J. S. N77-34033
DUMAS, L. K. N77-33389
DUNCAN, L. M. N77-33686
DUNDERDALE, T. C. N77-33179
DUNNILL, W. A. N77-33105
DUPDONALDSON, C. N77-33537
DURELLI, A. J. N77-33959
DURENBERGER, D. N77-33402
DUTTON, E. J. N77-34029
DUVAL, C. N77-33500
DYER, P. E. N77-33125
DYMENT, A.

E

EATOUGH, D. J. N77-33692
ECCLESTON, B. H. N77-33375
ECHTEMACHT, K. L. N77-33766
EDDOWES, E. E. N77-33216
EDELSTEIN, S. A. N77-33512
EDWARDS, D. N77-33557
EDWARDS, J. T. N77-33667
EDWARDS, R. M. N77-33139
EERKENS, J. W. N77-33263
EGGER, R. L. N77-33483
EGOROV, N. P. N77-33428
EHRENBERG, S. N. N77-33734
N77-33735
N77-33199
EICKMANN, K. E. N77-33568
EIDENSHINK, J. C. N77-33673
EISENHARD, R. M. N77-33267
EISENMANN, J. R. N77-33643
ELZINGA, E. R. N77-33434
EMBREE, E. J. N77-33739
ENGLISCH, W. N77-33789
ENGLISH, R. A. N77-33691
ENSMINGER, J. T. N77-33815
EPSTEIN, S. E. N77-33891
ERICKSON, R. A. N77-33335
ERNST, H. N77-33608
ERSKINE, W., JR. N77-33609
N77-33569
ESPARZA, F. N77-33587
ESTES, J. E.
EVANS, J. S. N77-33830
EVANS, T. L. N77-33368
EVERITT, C. W. F. N77-33223

F

FACCA, G. N77-33183
FAELTHAMMAR, C. G. N77-33736
FAIRALL, P. N77-33310
FAIRMAN, R. D. N77-33418
FANALE, F. P. N77-34080
N77-34081
N77-34082
FARRELL, C. A., JR. N77-33164
FAULKNER, G. D. N77-33949
FEARS, C. B. N77-33551
FELDMAN, W. C. N77-34091
FELTON, C. A. N77-33149
FEND, A. V. N77-33381
N77-33382
FENN, D. N77-34051
FERGUSON, J. K. N77-33787
N77-33788
FERGUSON, S. N77-33231
FERNANDEZ-PARTAGAS, J. N77-33774
FERNHOLZ, H. H. N77-33220
FINLEY, P. J. N77-33220
FISCHER, K. N77-34089
FISCHHOFF, B. N77-34045
FISHER, H. C. N77-33641
FLOTTORP, G. N77-33852
FOGEL, M. M. N77-33702
FOND, S. N77-33942
FONDREN, R. A. N77-33912
FORM, P. N77-33140
FOSTER, D. S. N77-33753
FOWLER, C. F. N77-33619
FOWLER, J. W. N77-33235
FOX, C. H., JR. N77-33108
FRANKLIN, J. A. N77-33151
FRASER-SMITH, A. C. N77-33395
FRATILA, R. N77-33939
FRECHE, J. C. N77-33159
FREY, H. N77-33710
FROME, W. J. N77-33786
FROST, J. D., JR. N77-33793
FROST, R. T. N77-33296
FRY, P. F. N77-33178
FUCHS, L. N77-33109
FUJITA, J. N77-33981
FUJIWARA, M. N77-33987
N77-33987
FUKUDA, R. C. N77-33290
FUKUMASA, O. N77-34003
FULLER, R. R. N77-33216
FULTON, C. L. N77-33112
FUNK, W. T. N77-33505
FURUTANI, Y. N77-33982
FUTCH, A. H. N77-34012

G

GABOVICH, A. M. N77-33410
GABY, D. C. N77-33768
GAERTNER, K. P. N77-33956
GAHN, B. M. N77-33960
GAJRIA, C. N77-33345
GALAUP, J. P. N77-33460
GALLAGHER, T. F. N77-33512
GARRIOTT, O. K. N77-33797
GARTEN, C. T., JR. N77-33691
GARTRELL, L. R. N77-33497
GARVIN, R. N77-33773
GARZA, F., JR. N77-34034
GAUNTER, D. J. N77-33720
GAWAIN, T. H. N77-33450
GAY, W. F. N77-33672
GEHRING, G. A., JR. N77-33320
N77-33324
GEHRING, R. W. N77-33152
GENNERY, D. B. N77-33895
GENTRY, D. R. N77-33358
GEORGE, A. N77-33493
GEORGE, L. L. N77-34039
GEORGE, S. N77-33773
GEYER, R. L. N77-33714
GIBELING, H. J. N77-33173
N77-33302
GIBSON, E. G. N77-33783
GIEBLER, R. N77-33417
GIGNAC, D. A. N77-33923
GILL, W. L. N77-34050
GILLESPIE, R. S. N77-33629
GILLMAN, H. D. N77-33357
N77-34020
GILSON, L. N77-33433
GIORGIERI, L. N77-33183
N77-33194
GJESTLAND, T. N77-33962
GLASS, B. P. N77-33719
GLENAR, D. A. N77-33721
GODDARD, R. N77-33525
GOEBEL, D. N77-33897

GOEDECKE, G. H. N77-33300
GOETHERT, B. H. N77-33179
GOGLIA, G. L. N77-33438
GOHARD, J. C. N77-33667
GOKCEN, N. A. N77-33301
GOLAND, L. G. N77-33846
GOLDHAMMER, L. J. N77-33607
GOLDMAN, N. N77-33879
GOLDSTEIN, H. W. N77-33585
GOLDSTEIN, R. E. N77-33815
GONGLOFF, H. R. N77-33250
GOODMAN, S. E. N77-33874
GOODYKOONTZ, J. N77-33161
GOOGIN, J. M. N77-33334
GORDON, J. M. N77-33289
GORDON, W. E. N77-33389
GORE, E. N77-33670
GOUDY, A. J. N77-33288
GOWEN, R. J. N77-33819
GRAVES, N. J. N77-33332
GRAVES, R. C. N77-33788
GRAYBIEL, A. N77-33791
GRAYSON, T. H. N77-33771
GREEN, B. N77-33640
GREEN, H. M. N77-34022
GREEN, H. O. N77-33869
GREENBORG, J. N77-33653
GREENHOUSE, H. M. N77-33436
GREINER, H. F. N77-33518
GRENDA, R. N. N77-33585
GRETHER, D. N77-33655
GRIFFIN, M. G., SR. N77-33287
GRIFFITH, J. M. N77-33815
GRIGNETTI, M. C. N77-33880
GRIMES, P. G. N77-33608
N77-33609
GRISWOLD, P. N77-33144
GRODZKA, P. G. N77-33222
GROENEWEG, J. F. N77-33166
GROSS, J. M. N77-33741
GROSS, S. N77-33601
GRUBER, C. L. N77-33482
GRUSKA, R. P. N77-33286
GRYSON, P. N77-33125
GUIDICE, D. A. N77-34087
GUPTA, S. S. N77-33917
GURGANUS, E. A. N77-33579
GURNETT, D. A. N77-33387
N77-34083
GURNEY, F. J. N77-33326
GUTIERREZ, O. N77-33161
GUYOL, N. B. N77-33675

H

HADDOCK, F. T. N77-34085
HAEFELE, W. N77-33679
HAEFELI, R. C. N77-33255
N77-33256
HAGGERTY, J. J. N77-34049
HAGUE, D. S. N77-33100
HAJIC, E. J. N77-33587
HALCOMB, C. G. N77-33857
HALES, W. L. N77-33508
HALFORD, G. R. N77-33536
HALL, E. L. N77-33851
HALLDORSSON, T. N77-33739
HALLINAN, T. J. N77-33713
HALLISSY, J. B. N77-33115
HAMADA, Y. N77-33987
HAMILTON, J. J. N77-33420
HAMILTON, J. M. N77-33540
HAMILTON, R. J., JR. N77-33418
HAMILTON, W. T. N77-33214
HAMMER, D. N77-34007
HAMPTON, D. C. N77-33954
HANDLER, S. N77-33786
HANK, J. M. N77-33825
HANLON, L. R. N77-33270
HANNAH, J. W. N77-33569
HANNON, J. B. N77-33496
HANSEN, D. R. N77-33361
HANSEN, S. F. N77-34091
HANSER, F. A. N77-33684
HANSON, D. B. N77-33113
HARAMIS, A. C. N77-33271
HARDT, H. H. N77-33619
HARDY, B. R. R. N77-33948
HARRIS, E. D. N77-33224
N77-33225
HARRIS, F. L. N77-33877
HARRIS, J. A., JR. N77-33315
HARTLEY, A. K. N77-33880
HARTMAN, B. O. N77-33855
HARTMANN, G. L. N77-33202
N77-33203
HARVEY, C. A. N77-33202
HARVEY, K. L. N77-34086
HASKIN, L. A. N77-34077
HASTINGS, S. R. N77-33669
HATORI, K. N77-33403
N77-33408
HATORI, T. N77-33994
N77-33996

HAWKINSON, L. B. N77-33892
HAYASHI, S. N77-33574
HAYES, J. R. N77-33447
HAYFLICK, L. N77-33805
HAYFORD, D. T. N77-33266
HEDBERG, F. L. N77-33355
HEIKKILA, W. J. N77-33737
N77-33738
HEIMBAUGH, R. M. N77-33149
HEIMERL, J. M. N77-34028
HELLBAUM, R. F. N77-33442
HELLER, J. N77-34038
HELMS, V. T., III N77-33236
HENDERSON, T. D. N77-33957
HENDRICK, R. C. N77-33202
HENNE, P. A. N77-33114
HENNEKE, E. G. N77-33266
HENRY, W. L. N77-33815
HERRON, R. N77-33802
HERTZLER, B. L. N77-34055
HERZOG, H. W., JR. N77-33593
HESSER, J. E. N77-34062
HETDRICK, M. A. N77-33248
HETHERINGTON, J. S. N77-33516
HEWITT, F. G. N77-33509
HEYSON, H. H. N77-33112
HIEBERT, A. L. N77-33272
HILL, R. I. N77-33192
HILL, R. M. N77-33512
HILLMAN, K. N77-33956
HINDMARSH, A. C. N77-33925
HINDS, B. D. N77-33726
HINICH, M. J. N77-33921
N77-33938
HINTEREGGER, H. F. N77-33588
HIRANO, K. I. N77-33979
HIRSCHBERG, M. H. N77-33536
HIRST, E. N77-33644
HISE, E. C. N77-33641
HISKES, J. R. N77-34012
HITCH, T. T. N77-33366
HODDER, R. S. N77-33520
HOEH, A. N77-33308
HOENLINGER, H. N77-33211
HOFFLER, G. W. N77-33795
N77-33809
N77-33810
N77-33811
N77-33812
N77-33814
N77-33819
HOFFMAN, F. O. N77-33691
HOFFMAN, J. D. N77-33174
HOFFMAN, R. A. N77-33789
N77-33794
HOFFMANN, H. E. N77-33861
N77-33862
HOFFMANN, H. J. N77-33863
N77-33889
HOFMANN, W. N77-33141
HOIDALE, G. B. N77-33726
HOLCOMBE, C. E., JR. N77-33306
HOLDEMAN, J. D. N77-33720
HOLDREN, J. P. N77-34011
HOLL, R. N77-33188
HOLLOWICH, M. E. N77-33884
HOLMAN, R. E. N77-33590
HOLMES, B. J. N77-33104
HOLT, S. S. N77-34092
HOMICK, J. L. N77-33791
N77-33792
HONG, S. D. N77-33362
HONZAWA, T. N77-33995
HOPKINS, V. N77-33364
HOPWOOD, J. E. N77-33431
HORDINSKY, J. R. N77-33785
N77-33795
HORONJEFF, R. D. N77-33686
HOROWITZ, H. H. N77-33643
HORRIGAN, D. J., JR. N77-33818
HORTON, J. B. N77-33251
HOSKINS, R. N77-33644
HOVANESIAN, J. D. N77-33537
HOWDEN, W. E. N77-33890
HSIEH, B. J. N77-33548
HSU, S. A. N77-33747
HUBBARD, N. N77-34077
HUDSON, F. P. N77-33725
HUFF, D. D. N77-33592
HUFFMAN, J. K. N77-33108
HUFFMAN, S. N77-33602
HUGENSCHMIDT, M. N77-33495
HUGHES, C. L. N77-33582
HUGHES, T. H. N77-33589
HUMENIK, F. M. N77-33720
HUMES, T. N77-33667
HUMSKI, B. N77-33480
HUNG, Y. Y. N77-33537
HUNT, A. L. N77-34012
HURLEY, J. B. N77-33255
N77-33256
HUSOCK, B. N77-33327
HUSTON, S. L. N77-33448
HYPES, W. D. N77-33579

I

ICHIKAWA, Y. H. N77-33982
N77-33992
IGUCHI, H. N77-33989
IKEMURA, T. N77-33990
IKUTA, K. N77-33978
N77-33981
ILJAS, J. N77-33681
ILK, K. H. N77-33228
INGLIS, M. H. N77-33551
INNIS, R. C. N77-33151
INOUE, S. N77-33984
N77-33993
ISAACS, H. S. N77-33328
ISBELLE, T. R. N77-33178
ISBISTER, J. N77-34051
ISSEROW, S. N77-33318
ITATANI, R. N77-34003
N77-34004
ITO, Y. N77-33989
ITOH, K. N77-33984
N77-33993

J

JACKSON, J. M. N77-33796
JACKSON, M. M. N77-33809
N77-33810
JACOBS, E. W. N77-33907
JACOBS, H. R. N77-33376
JACOBSEN, R. A. N77-33130
JACOBSON, I. D. N77-33148
JAMES, D. J. N77-33500
JAMES, M. R. N77-33484
N77-33542
JANUSZ, W. N77-33813
JENSEN, T. A. N77-33485
JEWELL, W. F. N77-33230
JEWETT, F. B., JR. N77-33311
JOHANSEN, T. R. N77-33509
JOHNSON, C. N77-33853
JOHNSON, J. A., III N77-33227
JOHNSON, K. W. N77-33906
JOHNSON, N. F. N77-33526
JOHNSON, P. C. N77-33806
JOHNSON, R. L. N77-33351
N77-33503
N77-33795
N77-33809
N77-33810
N77-33814
N77-33819
JOHNSON, R. S. N77-33781
JOHNSON, S. L. N77-34058
JOHNSON, T. V. N77-34077
N77-34079
N77-34080
JOHNSTON, P. J. N77-33108
JOHNSTON, R. S. N77-33780
JONES, C. E. N77-33257
JONES, H. L. N77-33247
JONES, N. L. N77-33578
JONES, R. W. N77-33508
JONES, W. L. N77-33166
JONES, W. P. N77-33121
JORDAN, F. L., JR. N77-33497
JORGENSEN, L. H. N77-33110
JORY, H. R. N77-33415
JOSHI, M. C. N77-33179
JUNKINS, J. L. N77-33728
JURGENSEN, M. F. N77-33645

K

KAJITANI, H. N77-34004
KAMAS, G. N77-33952
KAMIMURA, T. N77-33983
N77-34005
KANDIL, O. A. N77-33102
KANE-MAGUIRE, N. A. P. N77-33966
KANETSUNA, H. N77-33356
KARCHMER, A. M. N77-33162
N77-33163
KASATKINA, M. P. N77-33429
KASTRUP, R. V. N77-33285
KATSON, R. N77-33620
KATTAWAR, G. W. N77-33443
KAUFMAN, J. Y. N77-33156
KAULA, W. M. N77-34076
N77-34082
KAWABE, T. N77-33989
KAZA, K. R. V. N77-33107
KEARSLEY, E. A. N77-33445
KELMANSON, M. L. N77-33928
KENNEDY, J. J. N77-33421
KEPPLER, E. N77-34089
KERKERING, K. J. N77-33218
KERSHNER, D. D. N77-33157
KERWIN, J. P. N77-33784
KHAMBATTA, F. B. N77-33342
KHAZAL, R. R. N77-33947

KHIET, T. N77-33982
KHODAREV, Y. K. N77-33583
KHOZEIMEH, K. N77-33876
KIBLER, K. G. N77-33267
KIM, Y. Y. N77-33596
KIMBLIN, C. W. N77-33427
KIMPEL, J. N77-33773
KIMZEY, S. L. N77 33805
N77-33808
KING, J. H. N77-34065
N77-34066
KING, P. N77-33813
KINGERY, C. N77-33449
KISVARSANYI, G. N77-33570
KLEINAU, W. N77-33245
KNAPP, C. F. N77-33848
KNOTT, P. R. N77-33177
KOEPNICK, E. G. N77-33182
KOFF, B. L. N77-33190
KOHN, W. N77-33967
KOK, B. N77-33619
KOLB, C. E. N77-33502
KONARSKA, M. N77-33845
KONIGSBERG, R. L. N77-33830
KONNO, K. N77-33992
KOOSER, J. N77-33640
KORADECKA, D. N77-33845
KOREPA, A. C. N77-33689
KORWIN-PAWLOWSKI, M. N77-33423
KOSHUT, K. J. N77-33963
KOSTIA, T. N77-33128
KOTZ, S. N77-33915
KRAATZ, F. N77-33971
KRAFT, R. E. N77-33960
KRAMER, D. A. N77-33312
KRASNY, J. F. N77-33309
KRAUS, S. F. N77-33587
KRAUSE, D. A. N77-33284
KRAWCZAK, J. N77-33509
KROGH, F. N77-33911
KRON, H. H. N77-33889
KRONENBERG, M. E. N77-33587
KROON, D. H. N77-33327
KRUGER, R. P. N77-33851
KRUSE, H. R. N77-33870
KUBIS, J. F. N77-33796
KUHLTHAU, A. R. N77-33148
KUHN, T. E. N77-33168
KUNG, H. T. N77-33918
KUNIN, L. N77-33640
KUNZLEY, H. P. N77-34029
KVATERNIK, R. G. N77-33107
KYSER, A. C. N77-33146

L

LABRECQUE, J. L. N77-33712
LACOVIC, R. N77-33232
LAGALLY, M. G. N77-33303
LAKSHMINARAYANA, B. N77-33106
LAM, J. N77-33386
LAM, P. C. N77-33398
LANCASTER, E. J. N77-33122
LANDGREBE, D. A. N77-33553
LANGHANS, R. A. N77-33116
N77-33117
N77-33118
N77-33119
N77-33120
LANTZLE, U. N77-33680
LARGE, J. P. N77-33224
N77-33225
LARK, R. F. N77-33265
LARRABEE, E. E. N77-33667
LARUE, E. F. N77-33829
LASKA, R. N77-33662
LASSAHN, G. D. N77-33489
LAU, K. H. N77-33967
LAUNDER, B. E. N77-33472
LAURENCE, S. N77-33625
LAX, M. N77-34024
LAYDEN, G. K. N77-33353
LEACH, C. S. N77-33798
N77-33803
LEAL, A. N77-34030
LEBLANC, A. D. N77-33806
LEE, C. H. N77-33171
LEE, H. Y. N77-33477
LEE, Y. C. N77-33994
LEE, Y. W. N77-33878
LEETE, R. S., JR. N77-33531
LEFEBVRE, A. H. N77-33297
LEHMAN, J. M. N77-33230
LEHR, H. F. N77-33494
LEIGHTON, R. B. N77-33409
LEISHER, W. B. N77-33456
LEM, J. D. N77-33816
N77-33826
N77-33827
N77-33828
N77-33836
LENNARTSSON, W. N77-33717
LEONDES, C. T. N77-33903
LEONG, K. W. N77-33343
LERUP, L. N77-33582
LEVER, W. E. N77-33583
LEVIN, S. N77-33876
LEVINE, H. N77-33267
LEVY, A. N77-33596
LI, P. N77-33427
LIANG, C. Y. N77-33773
LICARI, J. J. N77 33805
LIM, R. S. N77-33808
LIN, W. N77-34065
LINTOTT, J. N77-34066
LIST, S. E. N77-33813
LITTLER, E. G. N77-33449
N77-33570
LITUNOVSKII, V. N. N77-33245
LIU, H. W. N77-33848
LIU, J. K. C. N77-33177
LIU, J. T. C. N77-33182
LIVERMAN, J. L. N77-33190
LLOYD, K. H. N77-33967
N77-33619
LLOYD, P. D. N77-33502
LOCKETT, G. J. N77-33845
LOCKHART, L. H. N77-33830
LODGE, C. G. N77-33992
LONG, S. I. N77-33640
LONGNECKER, M. N77-33845
LOPEZ, M. L. N77-33689
LORCH, G. N77-33423
LORE, J. D. N77-33963
LOVE, C. G. N77-33128
LOVINGER, A. J. N77-33915
LOW, C. H. N77-33971
LOWELL, C. N77-33960
LU, T. M. N77-33312
LUCZKOWSKI, S. N77-33309
N77-33587
LUDLAM, H. C. N77-33284
N77-33509
LUDWIG, L. P. N77-33911
LUECK, D. E. N77-33889
LUHMANN, J. G. N77-33587
LUNDERGAN, C. D. N77-33327
LUNT, R. R. N77-33851
LUSHINE, J. B. N77-33870
LUTWAK, L. N77-33796
LUTZ, E. E. N77-33148
N77-33168
LUXMOORE, R. J. N77-33918
LYBAS, J. M. N77-33640
N77-34029
N77-33107
N77-33146

M

MA, C. N77-33712
MACH, H. N77-33232
N77-33303
MADALA, R. N77-33106
MAEKAWA, E. N77-33386
N77-33398
MAGUREGUI, J. N77-33122
MAHAN, R. E. N77-33553
MAJEWICZ, T. G. N77-33116
MALIN, M. C. N77-33117
N77-33118
MALMBERG, A. F. N77-33119
MALTEZOU, S. P. N77-33120
MAMANTOV, G. N77-33680
MANKIN, J. B. N77-33224
MANN, M. J. N77-33225
N77-33265
N77-33667
N77-33829
MANTON, M. J. N77-33662
MARCUS, R. A. N77-33489
MARECHAL, J. P. N77-33967
MARGITAN, J. J. N77-33472
MARKARIAN, R. K. N77-33625
MARKIEWICZ, L. N77-34024
MARTIN, C. F. N77-33353
MARTIN, D. J. N77-33798
MARTIN, J. A. N77-33803
MARTIN, N. N77-34030
MARTIN, S. F. N77-33806
MARTIN, W. A. N77-33171
MARTIN, W. N. N77-33477
MARTINEZ-SANCHEZ, M. N77-33994
MARTZ, H. F., JR. N77-33878
MARUYASU, T. N77-33531
N77-33297
N77-33230
N77-33494
N77-33409
N77-33456
N77-33816
N77-33826
N77-33827
N77-33828
MASE, A. N77-33836
MASRY, E. N77-33717
MASSARO, M. J. N77-33903
MAST, G. B. N77-33343
MASTERS, L. W. N77-33854
MASUR, H. N77-33531
MASURSKY, H. N77-34030
N77-33535
MATSUURA, K. N77-33535
MAUGHMER, M. D. N77-33477
MAUS, J. R. N77-33537
MAYFIELD, B. M. N77-33349
MAZELIS, M. N77-33868
MAZELSKY, B. N77-33644
MCADOO, S. F. N77-33824
MCBRIDE, G. H. N77-33905
MCCARTHY, A. E. N77-33255
MCCARTHY, M. M. N77-33256
MCCARVILL, W. T. N77-33428
MCCAULEY, J. N77-33314
MCCLEARY, R. K., JR. N77-33854
MCCLIMENS, M. G. N77-33452
MCCOLLUM, G. W. N77-33630
MCCOMB, H. G., JR. N77-33718
MCCORD, T. B. N77-33733
N77-33581
MCCORMACK, R. G. N77-33764
N77-33804
MCCORMICK, M. P. N77-33209
MCCOY, T. H. N77-33418
MCCREESH, A. H. N77-33937
MCDERMON, J. N. N77-33114
MCDONALD, H. N77-33739
MCDONNELL, B. J. N77-33306
MCDONNELL, J. D. N77-33430
MCFADDEN, R. W. N77-33344
MCGANN, E. Y. N77-33733
MCGILL, R. L. N77-33313
MCGREEVY, M. G. N77-33303
N77-33833
N77-33835
MCLARTY, T. T. N77-33871
MCLAUGHLIN, E. J. N77-33881
MCLAUGHLIN, R. J. N77-33518
MCNEE, R. C. N77-33276
MCRAE, D. S. N77-33727
MCSPADDEN, W. R. N77-33629
MEADORS, J. G. N77-34058
MEADY, P. L. N77-33768
MEIER, P. M. N77-33798
MEISENHEIMER, R. G. N77-33665
MELNYK, P. N77-33666
MELVIN, J. W. N77-33592
MENDERSHAUSEN, H. N77-33546
MENDLOWITZ, R. A., SR.
MENGKL, C. E.
MENNELL, R. C.
MERRILL, W. N77-33588
MICHAELIS, T. D. N77-33490
MICHEL, E. L. N77-33491
N77-33731
MICHEL, R. N77-33406
MIDDLEBROOKS, E. J. N77-33407
MIDZUNO, Y. N77-33904
MIESZKUC, B. J. N77-33653
MIKOLOWSKY, W. T. N77-33341
MIKULSKI, W. N77-34075
MILES, L. N77-34076
MILGRAM, D. L. N77-34077
MILLARD, J. J. N77-34080
MILLER, C. W. N77-33896
MILLER, E. F., II N77-33597
N77-33298
MILLER, E. K. N77-33592
MILLER, E. P. N77-33116
MILLER, L. S. N77-33117
MILLER, M. C. N77-33118
MILLER, R. H. N77-33119
MILLS, J. F. N77-33120
MINEAR, J. N77-33756
MINERBO, G. N. N77-33965
MINNIS, P. N77-33189
MIRTICH, M. J. N77-33283
MITCHELL, G. C. N77-33683
MITCHELL, G. L. N77-33845
MITCHELL, J. D. N77-33261
MITSUHASHI, T. N77-33525
MIYAHARA, T. F. N77-33570
MIYAMOTO, K. N77-33946
MIYOSHI, K. N77-34086
MIZUNO, K. N77-33892
MOATS, R. R. N77-33901
MODER SM, J. J. N77-33667
MOELLER, G. L. N77-33530
MOHAMED, H. A. N77-33555
MOHON, N. N77-33558
MOHRI, A. N77-33559
MOIR, R. W. N77-33560
MOLL, J. W. N77-33561
MONGE, J. J. N77-33562
MONGIA, H. C. N77-33563
MONTEGANI, F. J. N77-33574
MONTGOMERY, F. O., JR. N77-33575
MONTROSE, C. J. N77-33576
MONZINGO, R. N77-33989
MOOERS, C. N. K. N77-33934
MORAN, J. P. N77-33251
MORAVEC, H. P. N77-33280
N77-33434
N77-33490
N77-34076
N77-34078
N77-33998
N77-33652
N77-33179
N77-33768
N77-33840
N77-33132
N77-33247
N77-33796
N77-33511
N77-33707
N77-33339
N77-33143
N77-33682
N77-33884
N77-33787
N77-33876
N77-34079
N77-34082
N77-33398
N77-33975
N77-33498
N77-34054
N77-33371
N77-33442
N77-33302
N77-33196
N77-33149
N77-33216
N77-33383
N77-33436
N77-33564
N77-33565
N77-33566
N77-33207
N77-33796
N77-33124
N77-33855
N77-33123
N77-33653
N77-33507
N77-33629
N77-34054
N77-34012
N77-35170
N77-33864
N77-33610
N77-33581
N77-33807
N77-33253
N77-33254
N77-33165
N77-33693
N77-33816
N77-33817
N77-33470
N77-33707
N77-33980
N77-33788
N77-33154
N77-33138
N77-33310
N77-33902
N77-33569
N77-33691
N77-33791
N77-33792
N77-33400
N77-33134
N77-33577
N77-33352
N77-33667
N77-33686
N77-34077
N77-33976
N77-33973
N77-33999
N77-33532
N77-33521
N77-33732
N77-33992
N77-33604
N77-33987
N77-34016
N77-33350
N77-33407
N77-33425
N77-34064
N77-33670
N77-33331
N77-33499
N77-33981
N77-34012
N77-33757
N77-33458
N77-33168
N77-33163
N77-33805
N77-33365
N77-34050
N77-33774
N77-33502
N77-33895

MORAVEK, D. N77-33779
MORGAN, E. M. N77-33235
MORSE, D. C. N77-33538
MORTON, R. R. N77-33578
MOSELEY, J. T. N77-33730
MOSKOWITZ, A. R. N77-33703
MOTSINGER, R. E. N77-33960
MOYERS, J. C. N77-33641
MOYNIHAN, C. T. N77-33365
MOZO, B. T. N77-33961
MROCZYNSKI, R. P. N77-33554
MUDGWAY, D. J. N77-33229
MUDHOLKAR, G. S. N77-33920
MUELLER, A. N77-33888
MUIRHEAD, V. U. N77-33957
N77-33958
N77-33959
MUKHERJI, P. N77-33281
MULHALL, B. D. L. N77-33875
MURAI, S. N77-33576
MURDOCK, J. W. N77-33446
MURDOCK, L. R. N77-33488
MURPHY, A. N77-33775
N77-33776
MURPHY, A. J. N77-33729
MURPHY, B. D. N77-33694
MURPHY, J. M. N77-34009
MURRELL, J. W. N77-33251
MURTHY, H. S. S. N77-33131
MUSGRAVE, F. S. N77-33782
MUSHOTZKY, R. F. N77-34072
MUTH, D. N77-33887
MYERS, J. M. N77-33656
MYERS, V. I. N77-33568

N

NACHTIGAL, D. N77-33665
N77-33666
NAGAI, N. N77-33403
N77-33404
N77-33405
N77-33406
N77-33407
N77-33408
NAKAJIMA, I. N77-33575
NANNELLI, P. N77-33357
N77-34020
NAYFEH, A. H. N77-33102
NEAL, B. F. N77-33549
NEES, M. N77-33869
NELSON, S. H. N77-33649
NEMEC, J. F. N77-33653
NEWMAN, L. N77-33690
NEWMAN, P. R. N77-34020
NICKELL, R. E. N77-33547
NICODEMUS, F. E. N77-33977
NICOGOSSIAN, A. E. N77-33795
N77-33809
N77-33810
N77-33817
N77-33819
NICOL, J. N77-33432
NICOLS, L. D. N77-33433
NIELSON, K. C. N77-33527
NILLES, J. M. N77-33665
N77-33666
NISENOFF, M. N77-33421
NISHI-KAWA, K. I. N77-33996
NISHIKAWA, K. N77-33984
N77-33991
N77-33997
NIU, K. N77-34001
NOLL, S. N77-33620
NOLTE, R. W. N77-33821
N77-33823
NORMAN, J. R. N77-33381
N77-33382
NORTON, R. L. N77-33700
NUSSBAUM, B. D. N77-34046
NUTKOWITZ, P. M. N77-33706
NUTTALL, R. L. N77-33370

O

OBAYASHI, H. N77-33910
OBERHOLTZER, J. E. N77-34058
OBERMAYER, A. S. N77-33433
OCHIAI, H. N77-33559
N77-33560
N77-33562
OCONNOR, G. E. N77-33751
OCONNOR, G. G. N77-33718
ODEGAARD, H. N77-33572
OEHME, R. N77-33413
OFFEN, G. R. N77-33372
OFFT, A. M. N77-33135
OGELMAN, H. N77-34063
OGINO, T. N77-33985
OHASA, K. N77-34016
OHKUBO, K. N77-33998
OHLSSON, D. N77-34015
OHSAWA, Y. N77-33983
OLIVER, R. C. N77-34005
OLSEN, R. N77-33617
OLSEN, R. O. N77-33262
OLSEN, W. F. N77-33732
OLSON, L. H. N77-33633
ONEILL, T. B. N77-33359
ORD, J. N77-33688
ORIOLI, P. L. N77-33799
OSBORNE, W. Z. N77-34020
OSTLUND, S. S. N77-33794
OVSANNIKOV, V. A. N77-33764
N77-33428

P

PAAS, J. E. N77-33960
PAFFRATH, D. N77-33697
N77-33698
PALMEDO, P. F. N77-33638
PALMER, H. E. N77-33837
PALMIERI, A. N77-33459
PALUDAN, C. T. N77-33578
PAN, C. H. T. N77-33523
PANDA, D. P. N77-33898
PANG, K. D. N77-34073
PAPADAKIS, J. S. N77-33913
PAPPIS, J. N77-33974
PARIS, P. C. N77-33335
PARKER, R. J. N77-33517
N77-33520
PARMELEE, R. A. N77-33385
PASHITSKIY, E. A. N77-33410
PASQUALETTI, M. J. N77-33598
PATASHNICK, H. N77-34067
PATEL, D. K. N77-33439
PATTERSON, D. B. N77-33368
PATTERSON, J. H., JR. N77-33961
PATTERSON, W. L. N77-33749
PATTON, J. T. N77-33645
PAUL, J. S. N77-33805
PAULSON, C. V. N77-33136
PAUNOVIC, M. N77-33277
PEACOCK, R. N77-33309
PEARCE, S. C. N77-33768
PEARSON, F. C. N77-34057
PEARSON, R. N77-33449
PEARSON, R. O. N77-33657
PEAVY, B. A. N77-33616
PECROT, A. J. N77-33567
PEERENBOOM, J. P. N77-33968
PELZMANN, R. F., JR. N77-34061
PERKINS, D. V. N77-33369
PERKINS, K. L. N77-33349
PERKINS, P. C. N77-33734
N77-33735
N77-33676
N77-33885
N77-33958
PERRY, A. M. N77-33959
PERRY, G. H. N77-33705
PESCHIER, T. D. N77-33397
N77-34076
N77-33627
PETERS, E. T. N77-33469
PETRO, J. P. N77-33623
PETTENGILL, G. N77-33624
PFEFFER, J. T. N77-33535
PFEIFER, H. J. N77-33794
PIACSEK, S. A. N77-33282
N77-33459
PIFKO, A. N77-33540
PINSKY, L. S. N77-34091
PIPPIN, H. G. N77-33507
PITTMADA, D. N77-33325
PLESS, W. M. N77-34059
PNEUMAN, G. W. N77-33707
POIRIER, M. A. N77-33787
POLK, J. S. N77-33435
POPPER, R. J. N77-33301
PORCELLA, D. B. N77-33768
PORTNOY, B. L. N77-33310
POST, A. E. N77-33259
POSTON, T. M. N77-33774
POTEAT, K. O. N77-33127
POTTHOFF, P. N77-33968
POWELL, R. W. N77-34076
PRICE, J. F. N77-33564
PRIKUR, J. N77-33565
PRINCE, B. E. N77-33566
PRINN, R. N77-33428
PROBINE, M. C. N77-33429
N77-33428
PRODUVNOV, A. B. N77-33322
PROKOPENKO, V. F.
PUGH, E. N.

Q

QUIST-HANSEN, S. N77-33852
QURESHI, A. S. N77-33670

R

RAADU, M. A. N77-34014
RACETTE, G. W. N77-33296
RADMER, R. J. N77-33619
RAHMAN, M. N77-33300
RAHN, P. H. N77-33568
RAMBAUT, P. C. N77-33798
N77-33800
N77-33803
RAMSDEN, S. A. N77-33500
RAMSEY, W. J. N77-33639
RAPPAPORT, S. N77-33969
REAP, R. M. N77-33753
REDDY, J. N. N77-33550
REDWOOD, D. R. N77-33815
REED, I. S. N77-33875
REED, L. E. N77-33860
REESE, I. R. N77-33136
REEVES, R. W. N77-33767
REICHENBACH, R. E. N77-33617
REID, J. N77-33798
REISTER, D. B. N77-33676
RENARD, R. J. N77-33748
RENGER, W. N77-33513
RENNESSON, J. N77-33191
REPP, M. N77-33708
RESCHKE, M. F. N77-33792
RESHOTKO, M. N77-33163
RESS, E. B. N77-33248
REYNOLDS, R. C. N77-33805
RICE, C. J. N77-33723
RICE, R. M. N77-33275
RICHARDS, H. L. N77-33306
RICHARDSON, J. C., JR. N77-33242
RICHTER, A. B. N77-33199
RICHTER, K. N77-34089
RICHTER, R. N77-33613
RICKER, R. E. N77-33437
RIDDELL, F. R. N77-33617
RIDER, L. J. N77-33786
RIEBE, G. D. N77-33112
RIEDEL, J. T. N77-33759
RIEMER, D. H. N77-33376
RIGOTTI, P. A. N77-33711
RINGHEIM, M. N77-33696
RIPPEY, J. O. N77-34050
RIPPSTEIN, W. J., JR. N77-33790
RIVAS, L. P. N77-33871
RIZZO, F. E. N77-33327
ROACH, F. N77-33620
ROBBINS, D. H. N77-33865
ROBERTS, G. O. N77-33623
N77-33624
ROBERTS, H. L. N77-34050
ROBERTS, R. D. N77-33414
ROBERTSON, C. K. N77-34035
ROBERTSON, D. S. N77-33588
ROBIN, A. M. N77-33374
ROBINETTE, J. L. N77-33850
ROBINSON, A. C. N77-33683
ROBINSON, J. W. N77-33411
ROCKWOOD, A. A. N77-33740
ROELS, O. A. N77-33625
ROGER, K. L. N77-33212
ROGERS, T. N77-33805
ROGERS, W. L. N77-34022
ROLL, R. N77-33938
ROPELEWSKI, C. F. N77-33767
ROSE, S. A. N77-33832
ROSENBAUER, H. N77-34083
ROSENBLATT, G. N77-33237
ROSENBLATT, M. N77-33178
ROSENKRANZ, W. A. N77-33481
ROSKAM, J. N77-33957
N77-33958
N77-33959
ROSOLOWSKI, J. H. N77-33360
ROSS, S. M. N77-33932
N77-33942
ROSSMASSLER, S. A. N77-34040
ROTH, J. R. N77-34000
ROTHSCHILD, R. N77-34063
ROTHSTEIN, L. R. N77-33383
ROTTY, R. M. N77-33676
ROUGE, B. K. N77-33851
ROUX, P. N77-34051
ROZENDAAL, H. L. N77-33100
RUBIO, R. N77-33724
RUDERMAN, H. N77-33640
RUMMEL, J. A. N77-33801
N77-33812
N77-33816
N77-33817
RUPPERSBERG, G. H. N77-33513
RUPPRECHT, G. N77-34067
RUSNAK, R. N77-33796
RUSSELL, S. P. N77-33396
RUSSELL, T. N77-33362
RUTHI, I. N77-33773
RYAN, J. W. N77-33588

S

SABOL, P. N77-33766
SAGAR, R. S. N77-33732
SAGNES, M. N77-33180

SAHALOS, J. N77-33972
SAKAGAMI, I. N77-33408
SAKAI, K. N77-33986
SALAMY, J. G. N77-33793
SALEH, J. N77-34030
SALTSMAN, J. F. N77-33536
SAMANIEGO, F. J. N77-33931
SAMET, M. G. N77-33391
SANDERSON, J. G. N77-33976
SANFORD, D. D. N77-33798
SANTNER, J. S. N77-33319
SANUKI, H. N77-33985
N77-33988
N77-34002
SASABE, H. N77-33365
SATHAYE, J. N77-33640
SATIJA, S. K. N77-33356
SAWIN, C. F. N77-33816
N77-33817
SAX, R. I. N77-33769
SAXON, S. V. N77-33796
SCHACHTER, A. P. N77-33817
SCHAEFER, G. N77-33413
SCHALIT, L. M. N77-33372
SCHELLHASE, R. N77-33492
SCHILLING, D. L. N77-33388
SCHIMKE, G. R. N77-34058
SCHINDLER, J. E. N77-33687
SCHKOLNICK, M. N77-33918
SCHLENKER, G. J. N77-33504
SCHLEUSENER, S. A. N77-33503
SCHLIEBAN, E. W. N77-33603
SCHMER, F. A. N77-33568
SCHMIDHAUSER, J. R. N77-33665
N77-33666
SCHMITT, C. R. N77-33334
SCHNEIDER, H. J. N77-33790
SCHNUERER, H. N77-33142
SCHOENER, G. C. N77-34057
SCHONBEK, M. E. N77-33922
SCHOPF, J. W. N77-34078
SCHOT, J. W. N77-33451
SCHREYER, J. M. N77-33334
SCHULER, A. N. N77-33340
SCHULMAN, J. H. N77-33412
SCHULZE, W. D. N77-33620
SCHUMAN, H. K. N77-33390
SCHUMATE, W. H. N77-33793
SCHWANZ, R. C. N77-33213
SCIAMBI, R. K. N77-34084
SCOTT, R. D. N77-33603
SCOTT, W. D. N77-33521
SCOTT, W. R. N77-33867
SCULLANE, M. I. N77-33279
SEEVERS, P. M. N77-33573
SEGUIN, W. R. N77-33766
N77-33770
SELDNER, K. N77-33169
SENSBURG, O. N77-33210
SERCEMITSOS, P. J. N77-34092
SERFLING, R. S. N77-33935
SERFOZO, R. F. N77-33944
SERNA, J. M. N77-33725
SEWELL, A. E. N77-33114
SEXTRO, R. N77-33640
SHAEFFER, D. L. N77-33691
SHAHANI, C. J. N77-33338
SHANNON, A. V. N77-33831
N77-33834
SHAPIRO, I. I. N77-33588
SHARP, L. R. N77-33723
SHAU, G. C. N77-33246
SHEN, M. N77-33361
N77-33362
SHEPHARD, W. E. N77-33138
SHESTAKOV, I. V. N77-33428
N77-33429
SHIELDS, V. E. N77-34050
SHIPE, A. P. N77-33759
SHOHARA, A. N77-33396
SHOJI, D. N77-33563
SHOR, R. W. N77-33691
SHORE, M. N77-33853
SHORT, B. J. N77-33130
SHREVE, D. C. N77-34073
SHTARKOV, Y. M. N77-33583
SHU, T. C. N77-33959
SHUBERT, G. L. N77-33103
SHUDDE, R. H. N77-33722
SHULZ, W. W. N77-33805
SHUMAKER, J. B. N77-33977
SIDWELL, K. N77-33145
SIEBER, D. C. N77-33975
SIEGEL, S. M. N77-33839
SIFERD, R. E. N77-33899
SIGNER, H. R. N77-33517
SIMON, R. N77-33419
SIMONEN, T. C. N77-34012
SIMONS, W. J. N77-33533
SINACORI, J. B. N77-33230
SING, A. K. N77-33933
SINGH, J. J. N77-34018
SINGPURWALLA, N. D. N77-34046
SKEEL, R. D. N77-33919
SKORVE, J. N77-33572
SLATFORD, J. N77-33185
SLAWECKI, M. A. N77-33633
SLINEY, H. E. N77-33351
SLIVINSKY, C. N77-33206
SLUSAREK, L. N77-33274
SMEETS, G. N77-33493
SMETANA, A. F. N77-33304
SMIRNOV, K. V. N77-33846
SMITH, B. F. N77-33310
SMITH, C. R. N77-33448
SMITH, C. S. N77-33534
SMITH, D. D. N77-33306
SMITH, D. L. N77-33758
SMITH, H. W. N77-33957
N77-33958
N77-33959
SMITH, J. L. N77-33506
SMITH, J. R. N77-33568
SMITH, L. S. N77-34020
SMITH, M. C., JR. N77-33798
N77-33800
SMITH, R. F. N77-33813
SMITH, S. R. N77-33278
SMULL, B. N77-33773
SMYRL, N. R. N77-33298
SMYTH, R. N77-33198
SMYTHE, C. C. N77-33858
SNYDER, C. W. N77-33643
SODERBLOM, L. N77-34078
SOEDER, J. F. N77-33169
SOHL, C. N77-33773
SOICHER, H. N77-33241
SONETT, C. P. N77-34075
N77-34078
SONNEVILLE, P. N77-33126
SOON, C. N77-33915
SOONG, D. N77-33361
SORENSON, D. L. N77-33707
SOUTHALL, R. N77-33891
SOVEY, J. S. N77-33999
SPENCER, D. J. N77-33515
SPIEGLER, E. N77-33438
SPIEWAK, I. N77-33678
SPITZER, C. F. N77-33485
SPIVAK, S. M. N77-33310
SPRINGER, R. N77-33140
SPRUNG, C. N77-33184
STADLER, C. R. N77-33798
STAHLE, C. V. N77-33250
STALLARD, B. W. N77-34012
STALNAKER, R. L. N77-33864
STANHOUSE, R. W. N77-33251
STANTON, E. L. N77-33269
STANTON, K. N77-33813
STAPLEFORD, R. L. N77-33230
STARK, H. H. N77-33295
STARK, J. P. N77-33321
STARR, T. L. N77-34017
STAUFENBIEL, R. N77-33205
STAVROPOULOS, N. N77-33401
STEFIK, M. J. N77-33946
STEIN, G. N77-33202
N77-33203
STEIN, R. S. N77-33362
STEINER, D. C. N77-33299
STERFLING, R. J. N77-33937
STETTNER, R. N77-34008
STEWART, I. N77-34078
STEWART, J. V. N77-33764
STIRLING, I. F. N77-33564
N77-33565
N77-33566
STOCK, D. N77-33805
STOCKHOFF, E. H. N77-33296
STOCKMAN, N. O. N77-33164
STOLDT, U. N77-33140
STOLL, R. D. N77-33664
STONE, C. M. N77-33547
STONE, H. W. N77-33259
STONE, R. F. N77-33251
STOOP, D. N77-33813
STOWELL, H. R. N77-33858
STRASZEWSKI, B. N77-33129
STRINGAS, E. J. N77-33175
STRONG, P. F. N77-33886
STUBBS, S. M. N77-33150
STUERKE, C. N77-33612
SUBBAIAH, P. N77-33920
SUGGATE, R. P. N77-33564
N77-33565
N77-33566
SUGIHARA, R. N77-33980
SULLIVAN, J. F. N77-33271
SUN, C. C. N77-33440
SUN, R. L. N77-33310
SWAIN, C. G. N77-33886
SWAIN, M. S. N77-33886
SWANA, J. N77-33251
SWANSON, A. N77-33974
SWEENEY, L. E., JR. N77-33397
SWIGER, B. N77-33966
SYKES, L. R. N77-33729
SYMONDS, P. S. N77-33543
SYMONS, E. P. N77-33444
SZOLOVITS, P. N77-33892
SZUCH, J. R. N77-33169
SZYMASZEK, J. W. N77-33360

T

TADA, H. N77-33335
TAKEDA, K. N77-33559
TAMIR, T. N77-33970
TANGE, T. N77-33984
N77-33994
TANNER, J. A. N77-33150
TANNER, R. L. N77-33690
TARAS, K. J. N77-33242
TATRO, G. N77-33171
TAYLOR, C. E. N77-34012
TAYLOR, G. R. N77-33788
TAYLOR, H. R. N77-33178
TCHERNOFF, A. N77-33964
TERASHIMA, Y. N77-33996
TEREN, F. N77-33167
TESKE, M. E. N77-33105
THIELE, G. A. N77-33972
THIROLF, R. G. N77-33805
THOMA, K. D. N77-34027
THOMAS, G. L. N77-33569
THOMPSON, C. D. N77-33918
THOMPSON, J. A. N77-33373
THORNTON, W. E. N77-33799
N77-33801
N77-33811
THORTON, W. E. N77-33812
TINCHER, W. C. N77-33358
TOENSKOETTER, H. N77-33197
TONEY, C. G. N77-33966
TOOMRE, J. N77-33623
N77-33624
TORIDIS, T. G. N77-33876
TORRES, F. E. N77-33768
TORVIK, P. J. N77-33545
TOTSUJI, H. N77-33910
TRINH, T. N77-33458
TROMBKA, J. L. N77-34078
N77-34082
TRUONG, T. K. N77-33875
TSEN, L. F. N77-33471
TSUCHIYA, K. N77-33559
N77-33562
TSUKISHIMA, T. N77-33989
TUNSTALL, J. N. N77-33455
TURCHI, P. J. N77-34007
TURNBULL, D. N77-34021
TURNER, M. R. N77-33209
TURNQUIST, D. V. N77-33419
N77-33420
TWIGG, D. W. N77-33866
N77-33891
TYLER, D. N77-33216

U

ULRY, D. N. N77-33152
UMLAUFT, G. N77-34089

V

VALLONE, C. B. N77-33135
VANDAM, K. N77-33959
VANETTEN, P. N77-33394
VANLANDINGHAM, H. F. N77-33200
VANNORDSTRAND, P. C. N77-33838
VANORMAN, B. L. N77-33748
VANWANDERHAM, M. C. N77-33315
VEERASAMY, V. N77-33179
VEST, R. W. N77-33416
VILLARD, O. G., JR. N77-33395
VIVION, M. C. N77-33953
VODOVOZOV, V. M. N77-33428
VOGEL, J. M. N77-33800
VOLLRATH, K. N77-33495
VYAS, B. N77-33328

W

WADLE, R. C. N77-34050
WAHI, P. K. N77-33307
WAKATANI, M. N77-33979
WALDRON, W. D. N77-33479
WALIA, P. N77-33171
WALIGORA, J. M. N77-33818
WALKER, D. Q. N77-33685
WALKER, R. W. N77-33156
WALLACE, J. W. N77-33579
WALLACE, W. E. N77-34023
WALLIN, S. P. N77-34050
WANG, C. H. N77-33356
WANG, D. N. K. N77-33330
WANG, E. E. N77-33299
WANG, G. C. N77-33303
WARD, R. N77-33413
WARNER, W. M. N77-33337
WARREN, D. E. N77-33390
WARREN, J. R. N77-33315
WARREN, W. H., JR. N77-34062
WARSHAW, S. I. N77-33926

WASHOM, B. J. N77-33665
N77-33666
WASSERMAN, R. N77-33217
WATANABE, K. N77-33561
WATANABE, M. N77-33991
WATANABE, T. N77-33555
N77-33558
N77-33997
N77-34002
WATERMAN, M. S. N77-33530
WATKINS, W. R. N77-33503
WATSON, W. I. N77-34058
WATTS, A. A. N77-33320
N77-33324
WATTSON, R. B. N77-33969
WAYNE, L. G. N77-33700
WEBB, A. W. N77-33421
WEBB, G. N. N77-34025
WEBER, J. N77-33702
WEDEL, E. N77-33739
WEEKS, J. R. N77-33328
WEEKS, M. H. N77-33371
WEIHRAUCH, G. N77-33494
WEINGARTEN, H. N77-33245
WEIR, R. C. N77-33487
WEISMILLER, R. A. N77-33554
WELBY, C. W. N77-33590
WELGE, H. R. N77-33114
WELLS, D. K. N77-33424
WELLS, O. D. N77-33114
WERNER, U. N77-33490
WEY, H. Y. N77-34022
WHEATCROFT, M. G. N77-33786
WHEDON, G. D. N77-33798
WHEELER, D. R. N77-33348
WHIPPLE, E. C. N77-33262
WHITE, E. H. N77-34050
WHITE, K. O. N77-33503
WHITE, R. E. N77-33305
WHITE, W. L. N77-33111
WHITFIELD, J. D. N77-33219
WHITTLE, M. W. N77-33798
N77-33800
WIESEMANN, W. N77-33802
N77-33739
WIGGERT, V. N77-33764
WIGGIN, E. A. N77-33677
WIGHTMAN, C. W. N77-33135
WILCOX, K. N77-33655
WILE, D. N77-33879
WILHELMSSON, H. N77-33910
N77-33991
WILKEN, B. N77-34089
WILKINS, J. D. N77-33527
WILLIAM, N. N77-33309
WILLIAMS, A. N. N77-33519
WILLIAMSON, D. N77-33775
N77-33776
WILLIAMSON, G. G. N77-33105
WILLIAMSON, G. R. N77-33538
WILLIAMSON, L. E. N77-33750
WILLIS, P. B. N77-33347
WILLMORTH, N. E. N77-33885
WILMOT, C. E. N77-34042
WILMS, W. W. N77-33647
WILSON, E. E. N77-33755
WILSON, S. G. N77-33136
WINSLOW, H. N77-33706
WINTER, M. G. N77-33255
N77-33256
WINTERHOFF, H. P. N77-34089
WINTERS, G. R., II N77-34053
WIRTHS, G. N77-33739
WISER, E. H. N77-33765
WISNIEWSKI, H. L. N77-33544
WITTELS, J. J. N77-33588
WOLF, H. W. N77-34060
WOLFER, B. M. N77-34050
WONG, J. S. L. N77-33875
WONG, Y. Y. N77-33891
WOOD, G. O. N77-33693
WOOD, J. N77-34078
WOODSTROM, J. H. N77-33549
WORCESTER, P. F. N77-33955
WRIGHT, R. E. N77-33966

X

XANTHAKIS, J. N77-33743

Y

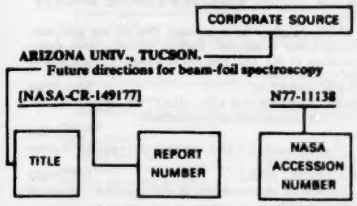
YABE, T. N77-34001
YADIN, M. N77-33943
YANG, K. T. N77-33476
YANIV, A. N77-34019
YARE, B. N77-34051
YEGOROV, V. V. N77-33583
YEH, B. T. N77-33205
YEH, K. N77-33310
YING, S. J. N77-33441
YIP, L. P. N77-33103
YOSHIKAWA, S. N77-33993
YOUNG, D. D. N77-33486
YOUNG, M. J. N77-33751
N77-33752
YOUNG, P. D. N77-33204
YOUNG, R. E. N77-34076
YOUNG, S. N77-33773
YU, P. S. N77-33893
N77-33945
YU, T. W. N77-33731

Z

ZACKS, S. N77-33940
ZAHOOR, A. N77-33335
ZAKRAYSEK, L. N77-33413
ZAPHIR, Z. N77-33363
ZAWISTOWSKI, E. A. N77-33309
ZEMANY, J. L. N77-33251
ZEMBER, R. J. N77-33850
ZESKIND, R. M. N77-33900
ZIMAN, Y. L. N77-33583
ZITTERKOPF, D. L. N77-33830

CORPORATE SOURCE INDEX

Typical Corporate Source Index Listing



Listings in this index are arranged alphabetically by corporate source. The title of the document provides the user with a brief description of the subject matter. The report number helps to indicate the type of document cited (e.g., NASA report, translation, NASA contractor report). The NASA accession number denotes the number by which the citation is identified. The titles are arranged under each corporate source in ascending accession number order.

A

ACADEMY OF ATHENS [GREECE].
Solar activity and a global survey of precipitation
N77-33743

ACE-FEDERAL REPORTERS, INC., WASHINGTON, D. C.
Energy technologies for the west: Possible effects of Energy Technology on Land, Water, and Air Resources
[TID-27444] N77-33632

ACUREX CORP., MOUNTAIN VIEW, CALIF.
Alternate petroleum based fuels for naval fleet usage: potential availability, cost, and system impact
[AD-A041980] N77-33372

ADAMS [RONALD], NEW YORK.
Assessment of service requirements and design characteristics of present and future paratransit vehicles
[PB-267574/2] N77-33699

ADDIS TRANSLATIONS INTERNATIONAL, PORTOLA VALLEY, CALIF.
High speed foil breakers
[UCRL-TRANS-11226] N77-33428
Study of electric explosion of cylindrical foils in air
[UCRL-TRANS-11227] N77-33429

ADELPHI UNIV., GARDEN CITY, N. Y.
Statistics of chain molecules between two adsorbing surfaces
N77-33277
Non-standard partial difference equations
N77-33907

ADVISORY GROUP FOR AERONAUTICAL RESEARCH AND DEVELOPMENT, PARIS [FRANCE].
Power plant reliability
[AGARD-CP-215] N77-33181
Structural Aspects of Active Controls
[AGARD-CP-228] N77-33208

ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT, PARIS [FRANCE].
A critical compilation of compressible turbulent boundary layer data
[AGARD-AG-223] N77-33220
Physical vulnerability of aircraft due to fluid dynamic effects
[AGARD-AR-106] N77-33478
Survey of computer-assisted writing and editing systems
[AGARD-AG-229] N77-34041

AERODYNE RESEARCH, INC., BEDFORD, MASS.
A CW HF laser with supersonic premixing and stationary shock initiation
[AD-A041779] N77-33502

AERONAUTICAL RESEARCH ASSOCIATES OF PRINCETON, INC., N. J.
Vortex interactions and decay in aircraft wakes
[NASA-CR-2870] N77-33105

AERONAUTICAL RESEARCH COUNCIL, LONDON [ENGLAND].
The current state of research and design in high pressure ratio centrifugal compressors
[AD-A041011] N77-33172
The numerical calculation of steady inviscid supercritical flow past ellipsoids without circulation
[AD-A041016] N77-33453

AERONAUTICAL SYSTEMS DIV., WRIGHT-PATTERSON AFB, OHIO.
Engine structural integrity program [ENSIP]
N77-33182

AEROPHYSICS RESEARCH CORP., BELLEVUE, WASH.
NSEG: A segmented mission analysis program for low and high speed aircraft. Volume 2: Program users manual
[NASA-CR-2808] N77-33100

AEROSPACE CORP., EL SEGUNDO, CALIF.
Density, compressibility, thermal conductivity, and mechanical movement of solid hydrazine
[AD-A042039] N77-33301
A numerical study of nonlinear effects on boundary-layer stability
[AD-A041088] N77-33446
CL XI nozzle F2 absorption experiment
[AD-A041566] N77-33515
Measurement of solid friction parameters of ball bearings
[AD-A042599] N77-33528
Neutral atmospheric waves in the thermosphere and tropospheric weather systems
[AD-A041239] N77-33723
Calculations of soft auroral bremsstrahlung and K alpha line emission at satellite altitude
[AD-A041599] N77-33727

AEROSPACE MEDICAL RESEARCH LABS., WRIGHT-PATTERSON AFB, OHIO.
Bibliography of research reports and publications: Impact, vibration, windblast and escape, 1942 - 1976
[AD-A042201] N77-33850

AEROSPACE RESEARCH LABS., WRIGHT-PATTERSON AFB, OHIO.
A spatial frequency analysis model for predicting human performance at visual pattern matching tasks
[AD-A041649] N77-33859

AIA RESEARCH CORP., WASHINGTON, D. C.
Early use of solar energy in buildings. A study of barriers and incentives to the widespread use of solar heating and cooling systems
[PB-267832/4] N77-33618

AIR FORCE ACADEMY, COLO.
High angle of attack flight control using stochastic model reference adaptive control
[AD-A041436] N77-33897

AIR FORCE AERO PROPULSION LAB., WRIGHT-PATTERSON AFB, OHIO.
A procedure for predicting the life of turbine engine components
N77-33192
Investigation of GaAs solar cell potential performance and cost
[AD-A040736] N77-33612

AIR FORCE AVIONICS LAB., WRIGHT-PATTERSON AFB, OHIO.
Conversion of computer software for the gimballed electrostatic gyro navigation system, volume 1
[AD-A041711] N77-33138

AIR FORCE COMMUNICATIONS SERVICE, RICHARDS-GEBAUR AFB, MO.
Special evaluation report on TACAN propagation
[AD-A041191] N77-33134

AIR FORCE ENVIRONMENTAL TECHNICAL APPLICATIONS CENTER, SCOTT AFB, ILL.
A simulated mission success indicator for use with probability forecasts at Travis AFB, California
[AD-A041880] N77-33751
Reforger 77 support. Part B: Test of a suggested approach to spreading climatology to grid points
[AD-A041879] N77-33752

AIR FORCE FLIGHT DYNAMICS LAB., WRIGHT-PATTERSON AFB, OHIO.
The conically symmetric Navier Stokes equations: Numerical solution for hypersonic cone flow at high angle of attack
[AD-A042072] N77-33123
Consistency in aircraft structural and flight control analysis
N77-33213
Prediction techniques for the characteristics of fin generated three dimensional shock wave turbulent boundary layer interactions
[AD-A042024] N77-33447

AIR FORCE GEOPHYSICS LAB., HANSCOM AFB, MASS.
Polarization spectra of centimeter wavelength solar bursts using whole-sun observations
[AD-A038782] N77-34087

AIR FORCE HUMAN RESOURCES LAB., BROOKS AFB, TEX.
Investigation of diagnostic, error detector and self-taught instructional strategies for flight simulator programs
[AD-A035682] N77-33216
Effects of visual propioceptive cue conflicts on human tracking performance
[AD-A042006] N77-33860

AIR FORCE INST. OF TECH., WRIGHT-PATTERSON AFB, OHIO.
Gravity modeling for precise terrestrial inertial navigation
[AD-A042419] N77-33139
The theory of diffraction from a holographic lens
[AD-A041537] N77-33486
Applications of the extremal principles of elasticity to the determination of stress intensity factors
[AD-A042669] N77-33545
Observability and identifiability of nonlinear dynamical systems with an application to the optional control model for the human operator
[AD-A041794] N77-33899

AIR FORCE INSTRUMENT FLIGHT CENTER, RANDOLPH AFB, TEX.
Evaluation of revised approach lighting criteria
[AD-A038442] N77-33218

AIR FORCE LOGISTICS COMMAND, WRIGHT-PATTERSON AFB, OHIO.
Preliminary results of USAF experience with engine monitoring and diagnostics
N77-33199

AIR FORCE MATERIALS LAB., WRIGHT-PATTERSON AFB, OHIO.
A study of constituent, dispersoid, and hardening particles in the fracture of 7075 aluminum alloys
[AD-A041421] N77-33319
Synthesis of polyimides curable by intramolecular cycloaddition
[AD-A041420] N77-33355

AIRESEARCH MFG. CO., LOS ANGELES, CALIF.
Rocket radiation handbook. Volume 1: Rocket radiation phenomenology and theory
[AD-A042640] N77-33263

AIRESEARCH MFG. CO., PHOENIX, ARIZ.
Pollution reduction technology program for small jet aircraft engines, phase 1
[NASA-CR-135214] N77-33168

AIRESEARCH MFG. CO., TORRANCE, CALIF.
Subsystem design analysis light weight alternator [model test program]. Addendum 2
[AD-A041257] N77-33171

AIX-MARSEILLES UNIV. [FRANCE].
Ratio between dynamical and thermal dissipation in turbulent flows
[AAAF-NT-77-21] N77-33472

ALABAMA UNIV., UNIVERSITY.
Application of remote sensing for planning purposes
[NASA-CR-150418] N77-33589

ALASKA UNIV., COLLEGE.
Spiral-like auroral forms: Observations and a proposed theory
N77-33713

AMERICAN SCIENCE AND ENGINEERING, INC., CAMBRIDGE, MASS.
Upgrading and testing program for narrow band high resolution planetary IR imaging spectrometer
[NASA-CR-155149] N77-33969

AMPEX CORP., REDWOOD CITY, CALIF.
High bit rate digital recorder
[AD-A041320] N77-33485

SOURCE

APPLIED SCIENCE ASSOCIATES, INC., APEX, N. C.
Investigation of the applications of GEOS-3 radar altimeter data in remote sensing of land and sea features
[NASA-CR-141428] N77-33577
ARA, INC., WEST COVINA, CALIF.
Investigation of an aluminum rolling helix crash energy absorber
[AD-A042084] N77-33132
ARGONNE NATIONAL LAB., ILL.
Nonlinear formulation of finite element by corotational coordinates
[ANL-CT-77-9] N77-33548
Instrumentation for automatic cycling of lithium-aluminum/iron sulfide secondary cells
[ANL-76-119] N77-33633
Strategies for commercializing customer thermal-energy storage
[ANL-ES-55] N77-33649
ARIZONA UNIV., TUCSON.
Mass filtering and velocity analysis of products of single collision reactions of barium with alkali halides N77-33282
Applied Remote Sensing Program [ARSP]
[E77-10240] N77-33571
Practical use of decision theory to assess uncertainties about actions affecting the environment
[PB-269011/3] N77-33702
ARMY AEROMEDICAL RESEARCH LAB., FORT RUCKER, ALA.
Frequency dependence of impulse noise attenuation
[AD-A042031] N77-33961
ARMY AIR MOBILITY RESEARCH AND DEVELOPMENT LAB., CLEVELAND, OHIO.
A Weibull characterization for tensile fracture of multicomponent brittle fibers
[NASA-TM-73790] N77-33929
ARMY AIR MOBILITY RESEARCH AND DEVELOPMENT LAB., FORT EUSTIS, VA.
An assessment of the hover performance of the XH-59A advancing blade concept demonstration helicopter
[AD-A042063] N77-33155
ARMY ARMAMENT COMMAND, ROCK ISLAND, ILL.
Description of laser spot motion during designation of moving targets
[AD-A041634] N77-33504
ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND, ABERDEEN PROVING GROUND, MD.
A magnetic fluid seal for measurement of aerodynamic surface pressure
[AD-A040345] N77-33352
ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND, DOVER, N. J.
Photochemical studies of secondary nitramines. Part 2: Ultraviolet photolysis and ozonolysis of RDX in aqueous solutions
[AD-A042715] N77-33304
ARMY CONSTRUCTION ENGINEERING RESEARCH LAB., CHAMPAIGN, ILL.
State of the art in fiber optics communications and data transfer
[AD-A042579] N77-33398
Guidelines for evaluating the seismic resistance of existing buildings
[AD-A042873] N77-33546
The effects of fast and thermal neutron flux and gamma radiation on the transmission characteristics of optical fibers
[AD-A042429] N77-33975
ARMY ELECTRONICS COMMAND, FORT MONMOUTH, N. J.
Spatial correlation of transionospheric signal-time-delays
[AD-A041447] N77-33241
Solid-state laser wavelength identification using a reference absorber
[AD-A041689] N77-33503
ARMY ELECTRONICS COMMAND, WHITE SANDS MISSILE RANGE, N. MEX.
The 12817A Lance missile number 4106, round number 295 RCL
[AD-A041448] N77-33744
The 12815C Lance missile number 4043, round number 294 RSL
[AD-A041453] N77-33745
The 17901AT Honest John missile numbers 1483/1494 round numbers 656 ASL/658 ASL
[AD-A041449] N77-33746
ARMY ENVIRONMENTAL HYGIENE AGENCY, ABERDEEN PROVING GROUND, MD.
Preliminary assessment of relative toxicity of ethyl centralite [N, N prime-diethylcarbanilide]
[AD-A041736] N77-33371
ARMY MATERIALS AND MECHANICS RESEARCH CENTER, WATERTOWN, MASS.
Powder processing of trip steel
[AD-A041069] N77-33318
ARMY MISSILE COMMAND, REDSTONE ARSENAL, ALA.
Aggregated shorads attrition weapon deck
[AD-A040390] N77-33242
ARMY MISSILE RESEARCH AND DEVELOPMENT COMMAND, REDSTONE ARSENAL, ALA.
Assessment of a dynamical gyroscope model utilizing digital simulation techniques
[AD-A042497] N77-33488
Surface detail and backscatter from coherently illuminated targets rotating about the axis of symmetry
[AD-A042349] N77-33506
Medium homogeneity in a chemical laser cavity using a lateral shearing interferometer
[AD-A042504] N77-33508
ARMY MOBILITY EQUIPMENT RESEARCH AND DEVELOPMENT CENTER, FORT BELVOIR, VA.
Computer technology in materials analysis. Part 1: Metals and alloys
[AD-A041031] N77-33877
ARO, INC., ARNOLD AIR FORCE STATION, TENN.
A survey of transition research at AEDC
[AD-A041740] N77-33219
General slender cone simulation at reentry flow conditions
[AD-A041063] N77-33227
EPA laser flame analyzer system
[AD-A041216] N77-33501
ASSOCIATION AERONAUTIQUE ET ASTRONAUTIQUE DE FRANCE, PARIS.
Turbulent effects in axial compressors
[AAAF-NT-77-20] N77-33180
ATMOSPHERIC SCIENCES LAB., WHITE SANDS MISSILE RANGE, N. MEX.
Lidar detection of subvisible reentry vehicle erosive atmospheric material
[AD-A041085] N77-33724
Calculation of selected atmospheric composition parameters for the mid-latitude, September stratosphere
[AD-A041081] N77-33725
Boundary layer dust occurrence. 4: Atmospheric dust over selected geographical areas
[AD-A041077] N77-33726
Positive ions in the middle atmosphere during sunrise conditions
[AD-A041799] N77-33732
Calibration technology for meteorological satellites
[AD-A041662] N77-33750
ATOMIC INDUSTRIAL FORUM, INC., WASHINGTON, D. C.
Role of nuclear power in meeting future U.S. energy needs
[IAEA-CN-36/396] N77-33677
ATOMIC REACTOR CENTRE, BANDUNG [INDONESIA].
Nuclear power aspects in an oil and coal producing country
[IAEA-CN-36/175] N77-33681
ATOMICS INTERNATIONAL, CANOGA PARK, CALIF.
Subsea nuclear power generating stations for offshore oil production operations. Preliminary safety and licensing information document
[AI-ERDA-13193] N77-33637

B

BAKER [MICHAEL, JR.] OF NEW YORK, INC., N. Y.
Design guidelines for energy conserving systems
[PB-268989/1] N77-33670
BALLISTIC RESEARCH LABS., ABERDEEN PROVING GROUND, MD.
Shock wave attenuation by perforated plates with various hole sizes
[AD-A041854] N77-33449
Coupling of X-ray deposition structural response
[AD-A042667] N77-33544
On the units of the equilibrium constant
[AD-A041953] N77-34028
BATTELLE COLUMBUS LABS., OHIO.
Review of current interest and research in water hyacinth-based wastewater treatment
[NASA-CR-155150] N77-33683
BATTELLE PACIFIC NORTHWEST LABS., RICHLAND, WASH.
K-area boiler-turbine alternator. Validation tests and validation project
[BNWL-2168] N77-33653
Investigate methods for measuring muscle and bone mass changes in astronauts and animals which occur during space flight
[NASA-CR-151518] N77-33837
Fusion systems engineering
[BNWL-1939-6] N77-34013
BAYLOR UNIV., HOUSTON, TEX.
Blood volume changes N77-33806
BDM CORP., VIENNA, VA.
Maintenance for the NET-2 network analysis program
[AD-A041074] N77-33896
BECHTEL CORP., SAN FRANCISCO, CALIF.
Coal gasification study
[AD-A041860] N77-33615
BELL AEROSPACE CO., BUFFALO, N. Y.
Cathodic kinetics during corrosion of aluminum alloy by high velocity sea water 5456-H117
[AD-A041724] N77-33324
BELL HELICOPTER CO., FORT WORTH, TEX.
Rotorcraft flight simulation with coupled rotor aeroelastic stability analysis. Volume 1: Engineer's manual
[AD-A042462] N77-33207
BENDIX CORP., BALTIMORE, MD.
Tactical miniature crystal oscillator
[AD-A041411] N77-33436
BHABHA ATOMIC RESEARCH CENTRE, BOMBAY [INDIA].
Analysis of gases in metals: The dc arc gas chromatographic technique. Part 4: Simultaneous determination of H2, O2, and N2 in metals using argon as inert gas medium
[BARC-800-PT-4] N77-33307
BOEING AEROSPACE CO., SEATTLE, WASH.
YC-14 control system redundancy N77-33214
Development of a high temperature capacitive pressure transducer
[NASA-CR-135282] N77-33483
Review of electrochemical impregnation for nickel cadmium cells
[NASA-CR-155155] N77-33601
BOEING CO., SEATTLE, WASH.
Advanced Thermal Energy Storage [TES] systems
[EPRI-EM-256-SY] N77-33622
BOEING CO., WICHITA, KANS.
Airplane math modeling methods for active control design N77-33212
BOEING COMMERCIAL AIRPLANE CO., SEATTLE, WASH.
Air traffic control experimentation and evaluation test
[AD-A041971] N77-33136
Technical and economic assessment of swept-wing span-distributed load concepts for civil and military air cargo transports
[NASA-CR-145229] N77-33147
BOEING COMPUTER SERVICES, INC., SEATTLE, WASH.
PROMETHEUS 2: A user oriented program for human crash dynamics
[PB-269305/9] N77-33868
OPTREG: An interactive computer program for optimization and regression
[PB-269480/0] N77-33891
BOEING VERTOL CO., PHILADELPHIA, PA.
Product improvement program evaluation
[AD-A042134] N77-33101
BOISE CENTER FOR URBAN RESEARCH, IDAHO.
Regional data center
[PB-268883/6] N77-34056
BOLT, BERANEK, AND NEWMAN, INC., CAMBRIDGE, MASS.
Intelligent on-line assistant and tutor system
[AD-A041727] N77-33880
BOLT, BERANEK, AND NEWMAN, INC., CANOGA PARK, CALIF.
Aircraft sideline noise: A technical review and analysis of comtemporary data
[AD-A042076] N77-33685
Further sensitivity studies of community-aircraft noise exposure [NOISEMAP] prediction procedures
[AD-A041781] N77-33686
BONN UNIV. [WEST GERMANY].
Changes in the composition of the atmosphere and their impact upon climatic variability: An overview
[BMA-24] N77-33761
BONNER AND MOORE ASSOCIATES, INC., HOUSTON, TEX.
Overview and review of motor gasoline desulfurization, volume I
[BERC/RI-76/17-VOL-1] N77-33377
Motor gasoline desulfurization study, volume 2
[BERC/RI-76/17-VOL-2] N77-33378
BOSTON COLL., CHESTNUT HILL, MASS.
Data Processing for the S3 satellites
[AD-A041912] N77-33243
BREVARD COUNTY PLANNING DEPT., MERRITT ISLAND, FLA.
LANDSAT planning applications in east central Florida
[E77-10238] N77-33569
BRIGHAM YOUNG UNIV., PROVO, UTAH.
Determination of sulfur speciation in industrial aerosols in an SO2 rich environment
[COO-2988-1] N77-33692
BRITISH AIRCRAFT CORP., FILTON [ENGLAND].
A practical optimum selection procedure for a motivator in active flutter suppression system design on an aircraft with underwing stores N77-33209
Active flutter suppression of an airplane with wing mounted external stores N77-33211

BRITISH LIBRARY LENDING DIV., BOSTON SPA [ENGLAND].
Short term experimental information network: Report to the evaluation subcommittee
[BLL-BLRDR-5369-[2113.56F]] N77-34042
Trends in Scholarly Publishing
[BLL-BLRDR-5299-[2113.56F]] N77-34043

BROOKHAVEN NATIONAL LAB., UPTON, N. Y.
Intergranular stress corrosion cracking of sensitized stainless steels
[BNL-NUREG-50596] N77-33328
Power transmission project
[BNL-22202] N77-33426
Role of renewable energy technologies in developing countries
[BNL-22311] N77-33638
Chemical-analytical techniques for aerosols
[BNL-22440] N77-33690
Architecture of the BNL archive and dissemination system
[BNL-22445] N77-34038
Analytical approach to the determination of urban population density gradients and its application to energy planning problems
[BNL-20916] N77-34054

BROWN UNIV., PROVIDENCE, R. I.
The integrated infrared intensities of the fundamental vibrations of acetylene, acetylene d2 and effective charges N77-33280
A theoretical approach to glass transition phenomena N77-33289
Dielectric constants, pair interactions and molecular shape of polar molecules N77-33293
Electronic structure of biopolymers N77-33336
On the large-scale structure in turbulent free shear flows
[AD-A042348] N77-33452
On dynamic plastic mode form solutions
[AD-A042361] N77-33543
Generic bifurcation with application to the von Karman equations N77-33905
Immersion and embedding of projective varieties N77-33906
Stochastic approximation algorithms for the sequential Monte Carlo optimization of stochastic systems N77-33928

BUREAU OF RADIOLOGICAL HEALTH, ROCKVILLE, MD.
Biological effects of electromagnetic waves. Selected papers of the USNC/URSI Annual Meeting, volume 2
[PB-268095/7] N77-33853

C

CALIFORNIA INST. OF TECH., PASADENA.
Millimeter-wave antenna design
[NASA-CR-152608] N77-33409
Particle size distribution of nitrate aerosols in the Los Angeles air basin
[PB-269349/7] N77-33703

CALIFORNIA RESEARCH AND TECHNOLOGY, INC., WOODLAND HILLS.
Investigation of local damage and impulse delivered to turbine blades by normal and oblique projectile impacts
[AD-A041780] N77-33178

CALIFORNIA STATE DEPT. OF TRANSPORTATION, SACRAMENTO.
Improved nuclear gage development phase 1 and 2
[PB-267106/3] N77-33496
Cement content of fresh concrete
[PB-266931/5] N77-33549

CALIFORNIA UNIV., BERKELEY.
Sulfur poisoning of hydrocarbon oxidation by palladium
[NASA-CR-155192] N77-33264
Viscoelastic properties of homogeneous block copolymers
[AD-A042044] N77-33361
Rheoptical studies of blends of poly [styrene-b-butadiene-b-styrene] and polystyrene
[AD-A042045] N77-33362
Human behavior in institutional fires and its design implications
[NBS-GCR-77-93] N77-33854
Average delay in queues with nonstationary Poisson arrivals
[AD-A041629] N77-33932
A heterogeneous arrival and service queueing loss model
[AD-A041883] N77-33942

CALIFORNIA UNIV., BERKELEY. LAWRENCE BERKELEY LAB.
Simultaneous reactions on a rotating-disk electrode
[LBL-6094] N77-33305
Mullite phase equilibria in the system: CaO-Al2O3-SiO2
[LBL-5706] N77-33329
Sintering of Al2O3 powder compact by hot stage scanning electron microscopy
[LBL-5763] N77-33330
Deformation behaviour of Ti-50.3 at Ni alloy
[LBL-5103] N77-33331
Analysis of wire antennas in the presence of a conducting half space. Part 3: The buried antenna
[UCRL-52228] N77-33400
Numerical investigation of confined turbulent shear flows
[LBL-5582] N77-33457
Analysis of the California energy industry
[LBL-5928] N77-33640
Promoting energy conservation through occupational licensure: A feasibility study
[LBL-5996] N77-33647
Ecological considerations of the solar alternatives
[LBL-5927] N77-33655
Computer networks in the physical sciences
[LBL-5594] N77-33894

CALIFORNIA UNIV., DAVIS.
SKETCHMOD: A policy-oriented modeling process for air quality management N77-33682
Higher plant metabolism and energetics in hypogravity: Amino acid metabolism in higher plants
[NASA-CR-155198] N77-33840
A characterization of convoluted geometric distributions
[AD-A042136] N77-33931

CALIFORNIA UNIV., LA JOLLA.
Active experiments in modifying spacecraft potential: Results from ATS-5 and ATS-6
[NASA-CR-152607] N77-33262

CALIFORNIA UNIV., LIVERMORE. LAWRENCE LIVERMORE LAB.
High speed foil breakers
[UCRL-TRANS-11226] N77-33428
Study of electric explosion of cylindrical foils in air
[UCRL-TRANS-11227] N77-33429
US energy flow in 1976
[UCID-17443] N77-33639
UXDD80 graphic system
[UCID-30146] N77-33873
EPISODE: An effective package for the integration of systems of ordinary differential equations
[UCID-30112-REV-1] N77-33925
Areal mapping of arbitrary plane regions onto rectangular meshes
[UCID-17415] N77-33926
Fusion-fission hybrid reactors: A capsule introduction
[UCID-17397] N77-34011
Mirror reactor surface study
[UCID-17168] N77-34012

CALIFORNIA UNIV., LOS ANGELES.
Theoretical investigation of anomalous properties of BCC, Ti, Zr, and Hf alloys
[AD-A042108] N77-33323
Neurophysiological estimates of human performance capabilities in aerospace systems
[AD-A038208] N77-33849
An implementation of the MSG interprocess communication protocol
[AD-A041630] N77-33871
A tool-bearing host in the National Software Works
[AD-A041652] N77-33881
Asymptotic properties of the discrete minimum variance output feedback control
[AD-A042782] N77-33903

CALIFORNIA UNIV., RIVERSIDE.
Energy in an oasis: Geothermal resource development in the Imperial Valley of California N77-33598
Improved convergence for linear systems using three-part splittings
[AD-A041729] N77-33914

CALIFORNIA UNIV., SAN DIEGO.
Specification of geosynchronous plasma environment
[AD-A041910] N77-33244
Finiteness of simplicial function spaces N77-33951
Reciprocal acoustic transmission in a mid-ocean environment N77-33955
Oscillatory indirect interaction between adsorbed atoms
[AD-A042376] N77-33967
Green's function calculation of a metal-metal interface
[AD-A041918] N77-34019

CALIFORNIA UNIV., SANTA BARBARA.
Evaluation of Ocean Color Scanner [OCS] photographic and digital data: Santa Barbara Channel test site, 29 October 1975 overflight
[NASA-CP-155171] N77-33587

CALIFORNIA UNIV., SANTA CRUZ.
Bootstrapping a small translator writing system
[AD-A041632] N77-33882

CALSPAN CORP., BUFFALO, N. Y.
Multipath and performance tests of TRSB receivers
[AD-A041891] N77-33135

COLUMBIA UNIV., NEW YORK.
An assessment of the role of simulators in military flight training. Volume 1: Assessment based on survey interviews
[AD-A041222] N77-33217

CANADIAN COMMERCIAL CORP., OTTAWA [ONTARIO].
Manufacturing methods and techniques for miniature high voltage hybrid multiplier modules
[AD-A041765] N77-33423

CARNEGIE-MELLON UNIV., PITTSBURGH, PA.
On the average number of maxima in a set of vectors and applications
[AD-A042597] N77-33918

CASE WESTERN RESERVE UNIV., CLEVELAND, OHIO.
Markovian queueing systems with stochastically varying arrival rates
[AD-A041969] N77-33943

CATHOLIC UNIV. OF AMERICA, WASHINGTON, D. C.
Dynamical shear and structural viscoelasticity in elastohydrodynamic lubrication
[AD-A041665] N77-33365

CENTRAL PIEDMONT URBAN OBSERVATORY, CHARLOTTESVILLE, VA.
A user's guide to the System/3 data base management system [S3DBMS]
[PB-268875/2] N77-33874

CENTRAL STUDIES ESTABLISHMENT, CANBERRA [AUSTRALIA].
Simulation and analysis of a tropical cyclon warning system
[AD-A042659] N77-33757

CENTRE D'ETUDES AERODYNAMIQUES ET THERMIQUES, POITIERS [FRANCE].
Turbulence measurements by laser anemometry
[AAAF-NT-77-07] N77-33473

CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE, MARSEILLES [FRANCE].
Dynamics of continua and particles from general covariance of Newtonian gravitation theory
[CNRS-CPT-76-P-849] N77-34029

CESSNA AIRCRAFT CO., WICHITA, KANS.
A-37B fatigue sensor evaluation program: Full scale test and field aircraft instrumentation
[AD-A042114] N77-33156

CHRYSLER CORP., MICHOUD, LA.
Results of a landing gear loads test using a 0.0405-scale model [16-0] of the space shuttle orbiter in the Rockwell International NAAL wind tunnel [OA163B], volume 1
[NASA-CR-151370] N77-33253
Results of a landing gear loads test using a 0.0405-scale model [16-0] of the space shuttle orbiter in the Rockwell International NAAL wind tunnel [OA163B], volume 2
[NASA-CR-151371] N77-33254

CITY COLL. OF THE CITY UNIV. OF NEW YORK.
Communication system analysis for manned space flight
[NASA-CR-151508] N77-33388
Solid state optics
[AD-A041822] N77-34024

CIVIL AVIATION AUTHORITY, REDHILL [ENGLAND].
Civil airworthiness requirements for powerplant reliability N77-33185

CLARK UNIV., WORCESTER, MASS.
An electron paramagnetic resonance study of some tetradentate Schiff base complexes of copper [II] N77-33279

CLARKSON COLL. OF TECHNOLOGY, POTSDAM, N.Y.
Strength of steel fiber concrete in adverse environments
[AD-A041380] N77-33539

COLORADO STATE UNIV., FORT COLLINS.
Satellite inferred surface albedo over northwestern Africa
[PB-267835/7] N77-33740
Formulation of approximate equations for modeling moist deep convection on the mesoscale
[PB-267592/4] N77-33756
On the use of finite Taylor's series approximations to certain exponential and power functions employed in cloud models
[PB-267834/0] N77-33762
A polynomial representation of 6-3 micrometers water vapor and 4.3 micrometers CO2 atmospheric transmissivities
[PB-267593/2] N77-33973

COLUMBIA UNIV., NEW YORK.
Studies of the mechanism of AgCl/Ag electrode reaction N77-33274
Scattering of rotational state selected C sF molecules by low energy electrons, 1. Determination of the surface disulfide bridge in proteins by pulse radiolysis, 2 N77-33290
Study of selected diatomic metal oxides and halides using chemiluminescence and laser-induced flourescence N77-33291

Directional solidification of polymers in a temperature gradient
N77-33144

A study of the marine magnetic anomaly pattern employing techniques based on the Fast Fourier Transform Algorithm
N77-33712

Theoretical seismograms of code phases calculated by a frequency-dependent full wave theory, and their interpretation
N77-33715

The shapes of marine magnetic anomalies: Paleomagnetic field behavior, paleomagnetic poles and ridge crest processes
N77-33716

A study of the intermediate and long wavelength gravity field of the worlds oceans
N77-33777

The effect of psychophysical method on the loudness of continuous and interrupted pure tones
N77-33954

COMMITTEE ON ENERGY AND NATURAL RESOURCES [U. S. SENATE].

The President's energy program
[GPO-88-556] N77-33599

COMPUTER SCIENCES CORP., LOS ANGELES, CALIF.

Satellite to satellite tracking error analysis studies and data processing
[NASA-CR-144832] N77-33237

Earth resources technology system standalone software package: Description and user's guide
[NASA-CR-152598] N77-33591

CONNECTICUT UNIV., STORRS.

Heterogeneous acid catalysis by polymer colloids
N77-33339

Biodegradable polymer: Synthesis and characterization of Alpha-benzylated nylons and related polymers
N77-33343

The surface chemistry of acrylic polymer colloids
N77-33345

Electron-dislocation interaction at low temperatures
[COO-2305-4] N77-34026

CONSTRUCTION ENGINEERING RESEARCH LAB. [ARMY], CHAMPAIGN, ILL.

Corrosion behavior of steel fibrous concrete
[AD-A041339] N77-33538

COUNCIL OF STATE GOVERNMENTS, WASHINGTON, D.C.

State environmental issues series. Energy conservation. Policy considerations for the states
[PB-267857/1] N77-33663

D

DALLAS DEPT. OF WATER UTILITIES, TEX.

Bachman treatment facility for excessive storm flow in sanitary sewers
[PB-269128/5] N77-34060

DAYTON UNIV. RESEARCH INST., OHIO.

Investigation of local damage and impulse delivered to turbine blades by normal and oblique projectile impacts
[AD-A041780] N77-33178

DECISION RESEARCH CORP., EUGENE, OREG.

The art of cost-benefit analysis
[AD-A041756] N77-34045

DEFENCE RESEARCH ESTABLISHMENT PACIFIC, VICTORIA [BRITISH COLUMBIA].

An interface unit to link a real-time analyzer with an incremental recorder [field operation and service manual]
[AD-A042130] N77-33487

DEFENSE COMMUNICATIONS ENGINEERING OFFICE, RESTON, VA.

System integration and interface transition issues
[AD-A041457] N77-33393

DEFENSE SYSTEMS MANAGEMENT SCHOOL, FORT BELVOIR, VA.

Major system acquisition: Is a separate spares contract better
[AD-A042775] N77-34033

Impact of competitive procurement on configuration control
[AD-A042876] N77-34034

NATO standardization versus US data releasability: An approach to resolving the conflict
[AD-A042959] N77-34053

DELAWARE UNIV., NEWARK.

Search for North American microtektites in Georgia coastal plain sediments
[NASA-CR-152596] N77-33719

DEPARTMENT OF AGRICULTURAL TECHNICAL SERVICES, PRETORIA [SOUTH AFRICA].

Monitoring the extent and occurrence of fire in the different veld types of South Africa with particular reference to its ecological role and role in range management
[E77-10226] N77-33557

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH, WELLINGTON [NEW ZEALAND].

Seismotectonic, structural, volcanologic, and geomorphic study of New Zealand; indigenous forest assessment in New Zealand; mapping, land use, and environmental studies in New Zealand, volume 1
[E77-10233] N77-33564

Seismotectonic, structural, volcanologic, and geomorphic study of New Zealand; indigenous forest assessment in New Zealand; mapping, land use, and environmental studies in New Zealand, volume 2
[E77-10234] N77-33565

Seismotectonic, structural, volcanologic, and geomorphic study of New Zealand; indigenous forest assessment in New Zealand; mapping, land use and environmental studies in New Zealand, volume 3
[E77-10235] N77-33566

DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, OBERPFAFFENHOFEN [WEST GERMANY].

The application of the Kalman-Bucy filter theory to the design of feedback networks for Doppler supported inertial navigation systems in flight
[DLR-IB-552-75/18] N77-33141

Development and construction of the small data acquisition system MINIDIG
[DLR-IB-553-76/6] N77-33492

Mission definition for the first flight of a multidiscip. tary lidar system formulated following discussions with representatives of various institutes
[DLR-IB-553-76/4] N77-33513

Significance of environmental research tasks at the German Aviation and Space Research Institute
[DLR-IB-553-75/5] N77-33697

Considerations on air pollution propagation from aircraft
[DLR-IB-553-75/6] N77-33698

The maximum detection range and the maximum recognition distance when observing ground targets from helicopters
[DLR-IB-553-76/3] N77-33861

Some test results on the visibility of obstacle and hazard beacons
[DLR-IB-553-76/5] N77-33862

DEUTSCHES GEODAETISCHES FORSCHUNG INSTITUT, MUNICH [WEST GERMANY].

Calculation of reference orbits by solving selfadjoint boundary value problem
[SER-C/DISS-228] N77-33228

DIKEWOOD INDUSTRIES, INC., ALBUQUERQUE, N. MEX.

Interaction of a rectangular ferrite slab with magnetic fields
[AD-A041944] N77-33386

DIRECTION CENTRALE DU MATERIEL DE L'ARMEE DE L'AIR, PARIS [FRANCE].

Maintenance methods for improving propulsion system reliability
N77-33184

DIRECTION DU MATERIEL ETUDES DE PROPULSION, PARIS [FRANCE].

The evolution and control of different performance degradation processes in modern propulsion systems
N77-33193

DOUGLAS AIRCRAFT CO., INC., LONG BEACH, CALIF.

Wind tunnel and analytical investigation of over-the-wing propulsion/air frame interferences for a short-haul aircraft at Mach numbers from 0.6 to 0.78
[NASA-CR-2905] N77-33114

Modeling and parameter uncertainties for aircraft flight control system design
[NASA-CR-2887] N77-33149

Primary Adhesively Bonded Structure Technology [PABST]. Phase IB: Preliminary design
[AD-A041536] N77-33354

DOUGLAS ECOLOGICAL CONSULTANTS LTD., VICTORIA [BRITISH COLUMBIA].

Monitoring air quality with lichen: A feasibility study
[NP-21650] N77-33689

DREXEL UNIV., PHILADELPHIA, PA.

Coverage of journal articles by selected US disciplinary science and technology abstracting and indexing services and its relationship to other characteristics of the scientific and technical literature, particularly citations
N77-34036

DUDLEY OBSERVATORY, ALBANY, N.Y.

Ice in space: An experimental and theoretical investigation
[NASA-CR-150417] N77-34067

DUKE UNIV., DURHAM, N. C.

User's manual: Computer-aided design programs for inductor-energy-storage dc-to-dc electronic power converters
[NASA-CR-152612] N77-33602

E

EAGLE-PICHER INDUSTRIES, INC., MIAMI, OKLA.

Purification, controlled doping and crystal growth of II-VI compound semiconductors
[AD-A041753] N77-34025

ECON, INC., PRINCETON, N. J.

Integrated study plan for space bioprocessing [phase 1]
[NASA-CR-155170] N77-33221

A cost benefit evaluation of the LANDSAT follow-on program
[NASA-CR-155156] N77-33584

EDGERTON, GERMESHAUSEN AND GRIER, INC., IDAHO FALLS, IDAHO.

Safety information system guide
[ERDA-76-45/9] N77-33384

Feasibility study of thermocouple correlation type transit time flowmeter in transient steam-water flow
[TREE-NUREG-1011] N77-33489

EDGERTON, GERMESHAUSEN AND GRIER, INC., SALEM, MASS.

Repetitive series interrupter II
[AD-A041144] N77-33419

Forty kilovolt megawatt average power thyratron [maps 40]
[AD-A042082] N77-33420

ELECTRICITE DE FRANCE, CHATOU.

Threedimensional flow around a fixed transverse cylinder
[AAAF-NT-77-19] N77-33126

ELECTROCHEMICAL TECHNOLOGY CORP., SEATTLE, WASH.

Reactions and electrochemical kinetics of newly-generated metal surfaces
[AD-A036570] N77-33317

ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION, BARTLESVILLE, OKLA.

Physical properties of gasoline/methanol mixtures
[BERC/RI-76/12] N77-33375

ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION, WASHINGTON, D. C.

Use of miniature optical probes in two-phase gas-liquid flow
[INEL-TR-10] N77-33460

Public acceptance of nuclear power
[IAEA-CN-36/507] N77-33630

Ocean Thermal Energy Conversion [OTEC] program summary
[ERDA-76-142] N77-33642

Program plan for ERDA's participation in the IEA working party on energy conservation research and development
[ERDA-77-57] N77-33648

Systems engineering for power
[ERDA-77-37] N77-33651

Second workshop on conceptual design studies of Experimental Power Reactor-1
[ERDA-77-36] N77-34009

ENGINEERING SCIENCES DATA UNIT, LONDON [ENGLAND].

Heat capacity and enthalpy of liquids. 3: Halogenated ethanes and ethylenes
[ESDU-77007] N77-33273

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D. C.

Inspection of Federal facilities for compliance with noise abatement standards
[PB-269298/6] N77-33704

ERIE TECHNOLOGICAL PRODUCTS OF CANADA LTD., TRENTON [ONTARIO].

Manufacturing methods and techniques for miniature high voltage hybrid multiplier modules
[AD-A041765] N77-33423

EUROPEAN SPACE AGENCY, PARIS [FRANCE].

Fundamental aerodynamic study of local injection in a turbulent boundary layer
[ESA-TT-412] N77-33127

Monte Carlo simulation of VOR/DME holding procedures. Basic notions and applications
[ESA-TT-419] N77-33142

Comparative systems study of magnetically suspended flywheels
[ESA-TT-393] N77-33245

Mathematical model for ascent trajectory optimization of a 4-stage launch vehicle for geosynchronous missions
[ESA-TT-409] N77-33246

The theory of diffraction by a perfectly conducting wedge of arbitrary angle applied to antenna patterns
[ESA-TT-416] N77-33401

Effect of free stream turbulence on turbulent boundary layers in incompressible flow
[ESA-TT-411] N77-33475

Multidisciplinary lidar system in Spacelab for application to atmospheric physics and remote sensing
[ESA-TT-404] N77-33739

Medium energy charged particle spectrometer. Experiment E8 Helios
[ESA-TT-390] N77-34089

EXXON ENTERPRISES, INC., NEW YORK.

Application of the Alsthom/Exxon alkaline fuel cell system to utility power generation
[EPRI-EM-384] N77-33643

EXXON RESEARCH AND ENGINEERING CO., LINDEN, N. J.
Redox bulk energy storage system study, volume 1
[NASA-CR-135296-VOL-1] N77-33608
Redox bulk energy storage system study, volume 2
[NASA-CR-135206-VOL-2] N77-33609

F

FEDERAL ENERGY ADMINISTRATION, WASHINGTON, D. C.
Solar collector manufacturing activity
[PB-266985/1] N77-33664
FLORIDA STATE UNIV., TALLAHASSEE.
On differentials, asymptotic normality and almost sure behavior of statistical functions, with application to M-statistics for location parameters
[AD-A042661] N77-33935
A differential for L-statistics
[AD-A042683] N77-33936
An annotated bibliography of selected references on maximal inequalities and their applications
[AD-A042681] N77-33937
FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, ROME [ITALY].
The application of ERTS imagery to the FAO/Unesco soil map of the world
[E77-10236] N77-33567
FORDHAM UNIV., NEW YORK.
Structure analyses of several organic compounds using X-ray crystallographic techniques
N77-33286
Task and work performance on Skylab missions 2, 3, and 4: Time and motion study: Experiment M151
N77-33796
Cosmology and the structure of scientific theory
N77-34064
FOSTER [JOHN] AND ASSOCIATES, INC., LOS ALTOS, CALIF.
Point source detection in infrared astronomical surveys
[NASA-CR-152004] N77-34061
FRANKLIN INST. RESEARCH LABS., PHILADELPHIA, PA.
Technical and economic feasibility of solar augmentation for boiler feedwater heating in steam-electric power plants
[COO-2864-1] N77-33626

G

GENERAL ACCOUNTING OFFICE, WASHINGTON, D. C.
Problems affecting usefulness of the national water assessment: Water resources council
[PB-269257/2] N77-33594
Energy policy decisionmaking, organization, and national energy goals
[PB-269299/4] N77-33671
GENERAL DYNAMICS/ELECTRONICS, SAN DIEGO, CALIF.
STDN ranging equipment
[NASA-CR-152603] N77-33257
GENERAL DYNAMICS/FORT WORTH, TEX.
Response of graphite composites to laser radiation
[AD-A041283] N77-33267
GENERAL ELECTRIC CO., CINCINNATI, OHIO.
High velocity jet noise source location and reduction. Task 4: Development/evaluation of techniques for inflight investigation
[AD-A041849] N77-33175
Supersonic jet exhaust noise investigation. Volume 4: Acoustic far-field/near-field data report
[AD-A041819] N77-33177
Aircraft engine design and development through lessons learned
N77-33190
GENERAL ELECTRIC CO., EVENDALE, OHIO.
Analytical and experimental studies of acoustic performance of segmented liners in a compressor inlet
[NASA-CR-2882] N77-33960
GENERAL ELECTRIC CO., HOUSTON, TEX.
Space shuttle life sciences requirements development and documentation
[NASA-CR-151529] N77-33838
GENERAL ELECTRIC CO., PHILADELPHIA, PA.
Shuttle payload vibroacoustic test plan evaluation. Free flyer payload applications and sortie payload parametric variations
[NASA-CR-152594] N77-33250
Feasibility and systems definition study for Microwave Multi-Application Payload [MMAP]
[NASA-CR-152611] N77-33251
Laboratory studies of silicon vapor deposition, phase A
[NASA-CR-145236] N77-33296
A study of selected environmental quality remote sensors for free flyer missions launched from the space shuttle
[NASA-CR-145252] N77-33585
GENERAL ELECTRIC CO., SCHENECTADY, N. Y.
Lead zirconate titanate [lzt] ceramics
[AD-A041507] N77-33360
GENERAL ELECTRIC CO., UTICA, N. Y.
Solderability testing of microcircuits
[AD-A041203] N77-33413
GENERAL ELECTRIC CO., WILMINGTON, MASS.
Solid polymer electrolyte [SPE] fuel cell technology program, phase 1/1A
[NASA-CR-151506] N77-33605
Solid polymer electrolyte [SPE] fuel cell technology program, phase 2/2A
[NASA-CR-151507] N77-33606
GENERAL SERVICES ADMINISTRATION, WASHINGTON, D.C.
Life cycle costing: Case studies
[PB-268162/5] N77-34047
GEOLOGICAL SURVEY, UNIVERSITY, ALA.
Application of remote sensing for planning purposes
[NASA-CR-150418] N77-33589
GEORGE WASHINGTON UNIV., WASHINGTON, D. C.
Detecting the shift in the probability of success in a series of Bernoulli trails
[AD-A042739] N77-33940
The stochastic formulation of a modified cobweb model
[AD-A042737] N77-34046
GEORGIA INST. OF TECH., ATLANTA.
Protection of nomex from ultraviolet degradation
[AD-A041494] N77-33358
Investigation of fabric weave construction versus tear resistance
[AD-A041259] N77-33359
Results in semi-inner-product spaces and generalized cosine operator functions
N77-33949
GEORGIA UNIV., ATHENS.
Behavior of mercury, chromium, and cadmium in aquatic systems
[PB-267559/3] N77-33687
GERAGHTY AND MILLER, INC., PORT WASHINGTON, N. Y.
Procedures manual for ground water monitoring at solid waste disposal facilities
[EPA-530/SW-611] N77-34051
GRUEN ASSOCIATES, LOS ANGELES, CALIF.
Land use and arterial spacing in suburban areas
[PB-269353/9] N77-34057
GRUMMAN AEROSPACE CORP., BETHPAGE, N.Y.
Master monitor display application study for F-14
[AD-A041570] N77-33158
Subsonic diffuser with injection flow
[RM-644] N77-33441
PLANS; a finite element program for nonlinear analysis of structures. Volume 2: User's manual
[NASA-CR-145244] N77-33535

H

HAMILTON STANDARD, WINDSOR LOCKS, CONN.
Study of noise and inflow distortion sources in the NASA QF-1B fan using measured blade and vane pressures
[NASA-CR-2899] N77-33113
HANFORD ENGINEERING DEVELOPMENT LAB., RICHLAND, WASH.
Displacement cross sections and PKA spectra: Tables and applications
[HEDL-TME-76-70] N77-33332
HARCO CORP., MEDINA, OHIO.
Investigation and status report on concentric neutral corrosion of URD extruded cable
[EPRI-EL-362] N77-33327
HARMON ENGINEERING, HUNTSVILLE, ALA.
Evaluation of analytical methodology for hydrocarbons in high pressure air and nitrogen systems
[NASA-CR-150409] N77-33379
Evaluation of analytical methodology for hydrocarbons in high pressure air and nitrogen systems
[NASA-CR-150410] N77-33380
HARRIS CORP., MELBOURNE, FLA.
AAFE large deployable antenna development program: Executive summary
[NASA-CR-2894] N77-33260
HARVARD COLL. OBSERVATORY, CAMBRIDGE, MASS.
Research study on dynamics of the solar atmosphere
[AD-A035939] N77-34088
HARVARD UNIV., CAMBRIDGE, MASS.
Creep and relaxation behavior of vapor-deposited amorphous selenium films: Flow behavior of glassy metals
[AD-A041111] N77-34021
HAWAII UNIV., HONOLULU.
Study of metabolism and energetics in hypogravity: Degenerative effects of prolonged hypogravity
[NASA-CR-155199] N77-33839
HETHERINGTON [J. S.], INC., MENLO PARK, CALIF.
Transparent materials processing system
[NASA-CR-150411] N77-33516
HOKKAIDO UNIV., SAPPORO [JAPAN].
Equivalent circuit representation of coupled multiwire line and its application
[MONO-24-1977] N77-33403
Modal decomposition and equivalent circuit representations of lossless coupled multiwire lines
N77-33404
Modal decomposition and equivalent circuit representations of lossy coupled multiwire lines
N77-33405
A new analysis of n-way hybrid power dividers with equiamplitudes
N77-33406
A new analysis of n-way hybrid power dividers with arbitrary power splitting ratios
N77-33407
A constant-resistance power divider using single-element couplers and its optimum design for wide bandwidth
N77-33408
HONEYWELL, INC., MINNEAPOLIS, MINN.
F-8C adaptive flight control laws
[NASA-CR-2880] N77-33202
F-8C adaptive flight control extensions
[NASA-CR-2881] N77-33203
HOUSTON UNIV., TEX.
An economic model of new crude oil and natural gas supplies in the lower 48 states
N77-33596
HOWDEN [WILLIAM E.], SOLANA BEACH, CALIF.
Symbolic testing: Design techniques, costs and effectiveness
[PB-268517/0] N77-33890
HUGHES AIRCRAFT CO., EL SEGUNDO, CALIF.
ATS-6 solar cell experiment/improvement
[NASA-CR-152609] N77-33607
HULL UNIV. [ENGLAND].
Interaction of pulsed CO2 and pulsed HF/DF laser radiation with gaseous and solid targets
[AD-A041486] N77-33500
HUMAN ENGINEERING LABS., ABERDEEN PROVING GROUND, MD.
A review of the literature on the legibility of alphanumerics on electronic displays
[AD-A040625] N77-33856
Investigation of inside light reflection problem on the Flat Plate Canopy [FPC] for model 209 AH-IS helicopter
[AD-A041332] N77-33858

I

IBM WATSON RESEARCH CENTER, YORKTOWN HEIGHTS, N.Y.
An algorithm for minimizing a differentiable function subject to box constraints and errors
[AD-A042916] N77-33924
IIT RESEARCH INST., CHICAGO, ILL.
Biaxial testing of graphite/epoxy composites containing stress concentrations, part 1
[AD-A041490] N77-33268
ILLINOIS UNIV., URBANA.
Biological conversion of biomass to methane
[COO-2917-76-2] N77-33627
ILLINOIS UNIV., URBANA-CHAMPAIGN.
Nuclear magnetic resonance investigation of the structure and dynamics of valine transfer ribonucleic acid [escherichia coli]
N77-33285
High pressure NMR self-diffusion studies of hydrogen bonded and related liquid systems
N77-33294
Mechanism of stress-corrosion cracking
[AD-A042106] N77-33322
Digital filtering using burst processing techniques
[AD-A042657] N77-33424
Direct initiation of detonation by non-ideal blast waves
[AD-A042811] N77-33454
Memory organizations and their effectiveness for multiprocessing computers
[AD-A042646] N77-33872
Gaussian elimination and numerical instability
[AD-A042159] N77-33919
Decision problems in the fundamental groups of 3-manifolds
N77-33950
Study of rate of nonequilibrium decomposition of energetic molecules
[AD-A040162] N77-33965
INDIANA UNIV., BLOOMINGTON.
The implications in satellite television for social and political change in the third world
N77-33231
Perceived environmental uncertainty and the two-step flow process of scientific and technical communication in research and development laboratories
N77-34037
INSTITUT FRANCO-ALLEMAND DE RECHERCHES, ST. LOUIS [FRANCE].
Mass spectrometric measurement of velocity distributions of nitrogen molecules in the expansion gas of lead azide after ultrahigh vacuum detonation
[ISL-R-108/76] N77-33308
Correlation analysis of flow velocity fluctuations in a subsonic free jet
[ISL-R-134/76] N77-33469

Method for the rapid temperature measurement of silver surfaces
[ISL-R-115/76] N77-33490
Temperature measurement of a cutting torch flame containing TiO2- and SiO2-particles
[ISL-R-123/76] N77-33491
Laser interference microphone for ultrasonic recordings and nonlinear acoustic investigations
[ISL-R-132/76] N77-33493
Processing of photographical data for analysis of target deformation in terminal ballistics experiments
[ISL-CO-201/76] N77-33494
Photographic study of rapid events by picosecond techniques
[ISL-CO-214/76] N77-33495
Laser dynamics and rotational relaxation in chemically formed carbon monoxide. Part 2: Further development and optimization of the chemical CO-laser
[ISL-R-137/76] N77-33514

INSTITUTE FOR DEFENSE ANALYSES, ARLINGTON, VA.
DoD energy R And D. Part 2: Military fuel operations. Performance and R and D implications
[AD-A042272] N77-33617

INSTITUTE OF GAS TECHNOLOGY, CHICAGO, ILL.
Experimental program for the development of peat gasification
[FE-2469-3] N77-33650

INTEGRATED ENTERPRISES, INC., HUNTSVILLE, ALA.
Appropriate technology: A directory of activities and projects
[PB-267970/2] N77-34052

INTERNATIONAL INSTITUTE FOR APPLIED SYSTEMS ANALYSIS, LAXENBURG [AUSTRIA].
Energy options open to mankind beyond the turn of the century
[IAEA-CN-36/538] N77-33679

IOWA INST. OF HYDRAULIC RESEARCH, IOWA CITY.
Heat transfer analysis for unsteady high velocity pipe flow
[AD-A041547] N77-33477

IOWA UNIV., IOWA CITY.
Electromagnetic plasma wave emissions from the auroral field lines
[NASA-CR-155172] N77-33387
Stereoscopic direction finding analysis of a type III solar radio burst: Evidence for emission at twice the plasma frequency
[NASA-CR-155176] N77-34083

J

JAROS, BAUM AND BOLLES, LOS ANGELES, CALIF.
Feasibility study of a 400 Hz, 4160 volt 3-phase electrical power distribution system
[AD-A042042] N77-33422

JET PROPULSION LAB., CALIF. INST. OF TECH., PASADENA.
Tracking and data system support for the Viking 1975 mission to Mars. Volume 3: Planetary operations
[NASA-CR-155168] N77-33229
Voyager: Journey to the outer planets
[NASA-CR-155147] N77-33233
Calibration of Viking imaging system pointing, image extraction, and optical navigation measure
[NASA-CR-155165] N77-33235
New model framework and structure and the commonality evaluation model
[NASA-CR-155157] N77-33249
Investigation of test methods, material properties and processes for solar cell encapsulants
[NASA-CR-155158] N77-33347
Compendium of critiques of JPL report SP-43-17: Automotive technology status and projections project
[NASA-CR-155180] N77-33519
Review of electrochemical impregnation for nickel cadmium cells
[NASA-CR-155155] N77-33601
Electrical 2-omega-cm 0.046-cm-thick silicon solar cells as a function of intensity and temperature
[NASA-CR-155166] N77-33604
Microprocessor Seminar, phase 2
[NASA-CR-155164] N77-33867
Review of finite fields: Applications to discrete Fourier, transforms and Reed-Solomon coding
[NASA-CR-155167] N77-33875
Recurrence relations for computing with modified divided differences
[NASA-CR-155177] N77-33911
Report of the Terrestrial Bodies Science Working Group. Volume 1: Executive summary
[NASA-CR-155189] N77-34074
Report of the Terrestrial Bodies Science Working Group. Volume 2: Mercury
[NASA-CR-155188] N77-34075
Report of the Terrestrial Bodies Science Working Group. Volume 3: Venus
[NASA-CR-155187] N77-34076
Report of the Terrestrial Bodies Science Working Group. Volume 4: The moon
[NASA-CR-155186] N77-34077
Report of the Terrestrial Bodies Science Working Group. Volume 5: Mars
[NASA-CR-155185] N77-34078
Report of the Terrestrial Bodies Science Working Group. Volume 6: The asteroids
[NASA-CR-155184] N77-34079
Report of the Terrestrial Bodies Science Working Group. Volume 7: The Galilean satellites
[NASA-CR-155183] N77-34080
Report of the Terrestrial Bodies Science Working Group. Volume 8: The comets
[NASA-CR-155181] N77-34081
Report of the Terrestrial Bodies Science Working Group. Volume 9: Complementary research and development
[NASA-CR-155181] N77-34082

JOINT INST. FOR ADVANCEMENT OF FLIGHT SCIENCES, HAMPTON, VA.
A qualitative assessment of a random process proposed as an atmospheric turbulence model
[NASA-CR-145247] N77-33145

JOINT PUBLICATIONS RESEARCH SERVICE, ARLINGTON, VA.
Translation on USSR science and technology biomedical sciences, no. 9
[JPRS-69899] N77-33841
Translations on USSR science and technology biomedical sciences, no. 10
[JPRS-69924] N77-33842
Space Biology and Aerospace Medicine, no. 4, 1977
[JPRS-69964] N77-33843
Translations on USSR science and technology biomedical sciences, no. 12
[JPRS-70017] N77-33844

K

KANNER [LEO] ASSOCIATES, REDWOOD CITY, CALIF.
Superconductivity of polar many-valley semiconductors and semimetals
[NASA-TM-75141] N77-33410
Space studies of earth resources: Methods and means of measurements and processing of information
[NASA-TT-F-17544] N77-33583
Methods for the electronic simulation of flight sounds
[NASA-TT-F-17432] N77-33956

KANSAS UNIV., LAWRENCE.
Flight evaluation of an advanced technology light twin-engine airplane [ATLIT]
[NASA-CR-2832] N77-33104

KANSAS UNIV. CENTER FOR RESEARCH, INC., LAWRENCE.
A research program to reduce interior noise in general aviation airplanes. Design of an acoustic panel test facility
[NASA-CR-155152] N77-33957
A research to reduce interior noise in general aviation airplanes. General aviation interior noise study
[NASA-CR-155153] N77-33958
A research program to reduce interior noise in general aviation airplanes
[NASA-CR-155154] N77-33959

KENTUCKY UNIV., LEXINGTON.
Response of the cardiovascular system to vibration and combined stresses
[AD-A039000] N77-33848

KLM ROYAL DUTCH AIRLINES, AMSTERDAM [NETHERLANDS].
Reliability versus cost in operating wide body jet engines
N77-33186

L

LAMONT-DOHERTY GEOLOGICAL OBSERVATORY, PALISADES, N. Y.
Marine pastures: A by-product of large [100 megawatt or larger] floating ocean-thermal power plants
[COO-2581-3] N77-33625
Plate tectonics and the discrimination of underground explosions from earthquakes
[AD-A041904] N77-33729

LANE INSTRUMENT CO., EL CAJON, CALIF.
Design and fabrication of termination boots for mechanical/electromechanical cable terminations
[AD-A041857] N77-33526

LITTLE [ARTHUR D.], INC., CAMBRIDGE, MASS.
Study of underground power cable installation methods
[EPRI-EL-374] N77-33432
Evaluation of stationary source particulate measurement methods. Volume 2: Oil-fired steam generators
[PB-269081/6] N77-33705
Evaluation of the disposal of flue gas desulfurization wastes in mines and the ocean: Initial assessment
[PB-269270/5] N77-34058

LOCKHEED-CALIFORNIA CO., BURBANK.
Lockalloy Be-38Al material characterization, 1976 year-end report
[AD-A041284] N77-33271

LOCKHEED ELECTRONICS CO., HOUSTON, TEX.
Scatterometer receiver dynamic range/linearity
[NASA-CR-151526] N77-33481
Sensor performance report, volume 4 [S-190A]
[NASA-CR-151528] N77-33581
S-191 sensor performance evaluation
[NASA-CR-151527] N77-33582

LOCKHEED-GEORGIA CO., MARIETTA.
Acoustic emission monitoring of crack propagation on the expedited wing fatigue test article X993
[AD-A041107] N77-33540

LOCKHEED MISSILES AND SPACE CO., HUNTSVILLE, ALA.
Space processing applications of ion beam technology
[NASA-CR-135261] N77-33222

LOCKHEED MISSILES AND SPACE CO., PALO ALTO, CALIF.
Development of microwave plasma detoxification process for hazardous wastes, phase
[PB-268526/1] N77-34055

LOGISTICS MANAGEMENT INST., WASHINGTON, D. C.
Life cycle costing: Case studies
[PB-268162/5] N77-34047

LOS ALAMOS SCIENTIFIC LAB., N. MEX.
Accounting systems for energy conservation
[LA-6569-MS] N77-33646
Development of air-monitoring techniques using solid sorbents. LASL Project R-059, NIOSH-IA-77-12
[LA-6738-PR] N77-33693
Electron microprobe analyses of minerals in Precambrian rocks at the Los Alamos Scientific Laboratory Geothermal Test Site, Temez Mountains, New Mexico
[LA-6695-MS] N77-33734
Preliminary studies of the alteration of a granite by an artificial hydrothermal system
[LA-6696-MS] N77-33735
Automated chest X-ray analysis
[LA-UR-77-532] N77-33851
Reconstruction of a source from a few [2 or 3] projections
[LA-6747-MS] N77-33976

LOUISIANA STATE UNIV., BATON ROUGE.
Atmospheric dispersion characteristics in the Louisiana coastal zone
[AD-A041099] N77-33747

LOUISVILLE UNIV., KY.
Lattice dynamics and intermolecular potentials for hydrocarbons
N77-34017

LYON UNIV. [FRANCE].
Structure of a turbulent boundary layer in longitudinal equilibrium in a positive pressure gradient
[AAAF-NT-77-18] N77-33474

M

MAINE UNIV., ORONO.
Proceedings of the ERDA Semiannual Solar photovoltaic Program Review Meeting
[CONF-760837-P2] N77-33628

MALLORY [P. R.] AND CO., INC., BURLINGTON, MASS.
Sealed primary lithium-inorganic electrolyte cell
[AD-A036172] N77-33611

MARTIN MARIETTA AEROSPACE, DENVER, COLO.
Spacelab contamination assessment. Payload/orbiter contamination control requirement study
[NASA-CR-150413] N77-33248

MARTIN MARIETTA CORP., BALTIMORE, MD.
Biological solar energy conversion: Approaches to overcome yield, stability and product limitations
[PB-267937/1] N77-33619

MARTIN MARIETTA CORP., DENVER, COLO.
Technology requirements for advanced earth-orbital transportation systems: Summary report
[NASA-CR-2867] N77-33255
Technology requirements for advanced earth-orbital transportation systems, dual-mode propulsion
[NASA-CR-2868] N77-33256

MARTIN MARIETTA LABS., BALTIMORE, MD.
Electromechanical machining
[AD-A042545] N77-33527

MARYLAND UNIV., COLLEGE PARK.
Extinguishability as a component measure of flammability hazards
[PB-269489/1] N77-33310
Effects of economic development on water resources
[PB-269096/4] N77-33593
A method of adaptive smoothing and edge enhancement
[AD-A041909] N77-33898
Region tracking using dynamic programming
[AD-A041908] N77-33902

Charge states of low energy ions from the sun
[NASA-CR 152586] N77-34084
MASSACHUSETTS INST. OF TECH., CAMBRIDGE.
Studies of orbital Eoetvoes experiments
[NASA-CR-155193] N77-33226
Wind energy conversion
[PB-268718/4] N77-33667
DOVE, a rational analysis of sparse data
[AD-A042638] N77-33886
An overview of OWL, a language for knowledge representation
[AD-A041372] N77-33892
MASSACHUSETTS INST. OF TECH., OAK RIDGE, TENN.
Efficiency of particle removal from viscous liquids with a hydroclone
[ORNL-MIT-237] N77-33458
MASSACHUSETTS UNIV., AMHERST.
Crystallization-induced reaction of aromatic copolyesters
N77-33340
Small-angle X-ray and small-angle light scattering studies of the morphology of polymer blends
N77-33342
The synthesis and characterization of selected copolyoxamides with special emphasis on their complexation behavior
N77-33346
MCDONNELL-DOUGLAS ASTRONAUTICS CO., HUNTINGTON BEACH, CALIF.
Space station systems analysis study. Part 3: Documentation. Volume 4: Supporting research and technology report
[NASA-CR-151521] N77-33238
Space station systems analysis study. Part 3: Documentation. Volume 5: Cost and schedule data
[NASA-CR-151520] N77-33239
MCELROY [RALPH] CO., AUSTIN, TEX.
Temperature oscillations at critical temperature in two-phase flow
[ANL-TRANS-1083] N77-33459
MIAMI UNIV., CORAL GABLES, FLA.
The corrosion kinetics of copper in aqueous amino acid and carboxylic acid solutions
N77-33312
MICHIGAN GOVERNOR'S COMMISSION ON ELECTRIC POWER ALTERNATIVES, LANSING.
Report of the Advisory Commission on Electric Power Alternatives
[PB-268479/3] N77-33668
MICHIGAN TECHNOLOGICAL UNIV., HOUGHTON.
Energy and protein production from pulp mill wastes
[COO-2983-2] N77-33645
MICHIGAN UNIV., ANN ARBOR.
Tolerance and response of the knee-femur-pelvis complex to axial impact
[PB-269059/2] N77-33864
Guidebook on anthropomorphic test dummy usage
[PB-268904/0] N77-33865
Vector processing in simulation
[AD-A041747] N77-33883
Industrial Productivity Workshop Executive Summary
[PB-267299/6] N77-34031
The 2-8 GHz solar dynamic spectra and polarization measurement feasibility study
[NASA-CR-152604] N77-34085
MIDWEST RESEARCH INST., KANSAS CITY, MO.
High pressure and temperature effects on the viscosity, density and bulk modulus of two liquid lubricants
[AD-A041902] N77-33364
MINISTERO DELLA DIFESA AERONAUTICA, ROME (ITALY).
Military engine deterioration in service connected with life cycle costs
N77-33183
MINISTRY OF DEFENCE, LONDON [ENGLAND].
Development procedures to promote reliability
N77-33188
MISSION RESEARCH CORP., SANTA BARBARA, CALIF.
Adiabatic oscillations of the one-dimensional SGEMP boundary layer
[AD-A041960] N77-34008
MISSOURI DEPT. OF NATURAL RESOURCES, ROLLA.
Structural lineament and pattern analysis of Missouri, using LANDSAT imagery
[E77-10239] N77-33570
MISSOURI UNIV., COLUMBIA.
Analysis of inherent errors in asynchronous digital flight controls
[AD-A041813] N77-33206
Red cell metabolism studies on Skylab
N77-33807
MITRE CORP., BEDFORD, MASS.
Time division multiplex frame synchronization: Acquisition, maintenance and reacquisition
[AD-A041384] N77-33435
MITRE CORP., MCLEAN, VA.
Interagency energy/environment research and development program: Status report 3
[PB-267443/0] N77-33662
Public participation in energy related decision making, edited transcripts
[PB-268781/2] N77-33674
MOLECULON RESEARCH CORP., CAMBRIDGE, MASS.
Program to evaluate, develop, and test poroplastic materials as improved electrical insulation for high power underground cables
[EPRI-EL-312] N77-33433

N

NAGOYA UNIV. [JAPAN].
Space and time evolution of two nonlinearly coupled variables: Special solutions
[IPPJ-273] N77-33910
Equilibrium of REB-ring with soft-core
[IPPJ-260] N77-33978
End pluggings of a linear theta pinch by hot high Z plasmas of high mass number
[IPPJ-262] N77-33979
Trapping and detrapping in a single wave and particle acceleration in a magnetoplasma
[IPPJ-263] N77-33980
New lens system using toroidal magnetic field for intense ion beams
[IPPJ-264] N77-33981
Nonlinear propagation of the ordinary mode in a hot magnetoplasma
[IPPJ-265] N77-33982
Computer simulations on the nonlinear frequency shift and nonlinear modulation of ion-acoustic waves
[IPPJ-266] N77-33983
Diffusion of a multi-ion species plasma due to drift wave fluctuations
[IPPJ-267] N77-33984
The nonlinear distortion of propagation cones of lower hybrid wave in an inhomogeneous plasma
[IPPJ-268] N77-33985
Effects of nuclear fusion on reaction on diffusion and thermal conduction in a magnetoplasma
[IPPJ-269] N77-33986
Helically symmetric equilibrium of current-carrying finite beta plasma
[IPPJ-270] N77-33987
Parametric decay of lower hybrid wave into drift waves
[IPPJ-272] N77-33988
Observation of current-driven ion sound wave in a turbulently heated plasma: The Mach 2
[IPPJ-274] N77-33989
Nonlinear electrostatic ion cyclotron waves in an RF-plugged inhomogeneous plasma slab
[IPPJ-275] N77-33990
Theory for space-time evolution of explosive-type instability
[IPPJ-276] N77-33991
Contribution of higher order terms in the reductive perturbation theory. 2: A case of strongly dispersive wave
[IPPJ-277] N77-33992
Saturation of kink instability and helical equilibrium of current carrying plasma column
[IPPJ-278] N77-33993
Real-space quasilinear theory of drift in a sheared magnetic field
[IPPJ-279] N77-33994
Experimental study on self-modulation of ion plasma oscillations
[IPPJ-280] N77-33995
Nonlinear heat and particle transport due to collisional drift waves
[IPPJ-281] N77-33996
Theory of two-fluid equilibrium of an axially symmetric plasma
[IPPJ-282] N77-33997
Study on RF voltage breakdown for LHRH in 0.8 - 0.9 GHz
[IPPJ-J-27] N77-33998
Possibility of stable implosion of structured pellet, 1
[IPPJ-293] N77-34001
Microinstabilities in a plasma slab with steep density gradient
[IPPJ-294] N77-34002
Anomalous effect of small collisions on the nonlinear interaction in a small cold beam and a warm plasma system
[IPPJ-295] N77-34003
Particle simulation on the propagation and plasma heating of the lower hybrid wave in the nonuniform system
[IPPJ-296] N77-34004
Propagation of nonlinear ion acoustic wave with generation of long-wavelength waves
[IPPJ-297] N77-34005
Rotational transform angle of the stellarator field with twisted coils
[IPPJ-271] N77-34016
NATIONAL ACADEMY OF PUBLIC ADMINISTRATION, WASHINGTON, D. C.
Public participation in energy related decision making, edited transcripts
[PB-268781/2] N77-33674
NATIONAL ACADEMY OF SCIENCES - NATIONAL RESEARCH COUNCIL, WASHINGTON, D. C.
Biologic effects of electric and magnetic fields associated with proposed project Seafarer
[AD-A042515] N77-33399
NATIONAL AERONAUTICAL LAB., BANGALORE (INDIA).
Bird strike hazards: A bibliography, 1971 - 1976
[NAL-BIBL-SER-77] N77-33131
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, WASHINGTON, D. C.
Spinoff 1977: An annual report
[NASA-TM-74908] N77-34049
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. AMES RESEARCH CENTER, MOFFETT FIELD, CALIF.
Prediction of static aerodynamic characteristics for slender bodies alone and with lifting surfaces to very high angles of attack
[NASA-TR-R-474] N77-33110
A flight investigation of the wake turbulence alleviation resulting from a flap configuration change on a B-747 aircraft
[NASA-TM-73263] N77-33130
Longitudinal handling qualities during approach and landing of a powered lift STOL aircraft
[NASA-TM-X-62144] N77-33151
Fault tolerant computing: A preamble for assuring viability of large computer systems
[NASA-TP-1067] N77-33868
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. GODDARD SPACE FLIGHT CENTER, GREENBELT, MD.
Satellite situation report, volume 17, number 4
[NASA-TM-74975] N77-33240
Precision surveying using very long baseline interferometry
[NASA-TM-X-71405] N77-33588
Thaumasia: A fossilized, early-forming Tharsis uplift
[NASA-TM-X-71404] N77-33710
A photometric study of the Orion OB 1 association. 3: Subgroup analyses
[NASA-TM-X-71407] N77-34062
Recognition of compact astrophysical objects
[NASA-SP-421] N77-34063
Interplanetary medium data book
[NASA-TM-X-72614] N77-34065
Interplanetary medium data book, appendix
[NASA-TM-X-72615] N77-34066
Heliocentric distance dependence of the interplanetary magnetic field
[NASA-TM-X-71398] N77-34068
Sources of magnetic fields in recurrent interplanetary streams
[NASA-TM-X-71400] N77-34091
The X-ray emitting galaxy Cen-A
[NASA-TM-X-71402] N77-34092
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LYNDON B. JOHNSON SPACE CENTER, HOUSTON, TEX.
Orbiter/payload proximity operations: Lateral approach technique
[NASA-TM-74965] N77-33247
Space shuttle program: Lightning protection criteria document
[NASA-TM-74974] N77-33252
Solar power satellite. Concept evaluation. Activities report. Volume 2: Detailed report
[NASA-TM-74942] N77-33600
Biomedical results from Skylab
[NASA-SP-377] N77-33780
Skylab medical program overview
N77-33781
Flight control experiences
N77-33782
Skylab 4 crew observations
N77-33783
Skylab 2 crew observations and summary
N77-33784
Skylab crew health: Crew surgeon's report
N77-33785
Skylab oral health studies
N77-33786
Analysis of the Skylab flight crew health stabilization program
N77-33787
Skylab environmental and crew microbiology studies
N77-33788
Radiological protection and medical dosimetry for the Skylab crewmen
N77-33789
Toxicological aspects of the Skylab program
N77-33790
Experiment M131. Human vestibular function
N77-33791
The effects of prolonged exposure to weightlessness on postural equilibrium
N77-33792
Experiment M133. Sleep monitoring on Skylab
N77-33793
Visual light flash observations on Skylab 4
N77-33794

Changes in the Achilles tendon reflexes following Skylab missions
N77-33795

Crew efficiency on first exposure to zero-gravity
N77-33797

Mineral and nitrogen metabolic studies, experiment M071
N77-33798

Physiological mass measurements in Skylab
N77-33799

Bone mineral measurement: Experiment M078
N77-33800

Muscular deconditioning and its prevention in space flight
N77-33801

Biostereometric analysis of body form
N77-33802

Biochemical responses of the Skylab crewmen: An overview
N77-33803

The response of single human bells to zero-gravity
N77-33805

Hematology and immunology studies
N77-33808

Lower body negative pressure: Third manned Skylab mission
N77-33809

Vectorcardiographic results from Skylab medical experiment M092: Lower body negative pressure
N77-33810

Hemodynamic studies of the legs under weightlessness
N77-33811

Anthropometric changes and fluid shifts
N77-33812

Evaluation of the electromechanical properties of the cardiovascular system after prolonged weightlessness
N77-33814

Results of Skylab medical experiment M171-metabolic activity
N77-33816

Pulmonary function evaluation during and following Skylab space flights
N77-33817

Metabolic cost of extravehicular activities
N77-33818

Determination of cardiac size from chest roentgenograms following Skylab missions
N77-33819

Skylab: A beginning
N77-33820

Lower body negative pressure device
N77-33821

Automatic blood pressure measuring system [M091]
N77-33822

Automatic blood pressure measuring system [M092]
N77-33823

Vectorcardiograph
N77-33824

A.I.e. in-flight blood collection system
N77-33825

Ergometer
N77-33826

Metabolic analyzer
N77-33827

Body temperature measuring system [M171]
N77-33828

Hardware report for experiment M133, sleep monitoring on Skylab
N77-33829

Skylab experiment M131: Rotating little chair
N77-33830

Experiment support system
N77-33831

In-flight medical support system
N77-33832

Carbon dioxide/dewpoint monitor
N77-33833

Atmospheric analyzer, carbon monoxide monitor and toluene diisocyanate monitor
N77-33834

Skylab hardware report operational bioinstrumentation system
N77-33835

Exerciser
N77-33836

Preliminary design study of a baseline MIUS
[NASA-TM-X-58193] N77-34050

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LANGLEY RESEARCH CENTER, LANGLEY STATION, VA.

Pressure distributions on a 1- by 3-meter semispan wing with a nonstreamwise tip in subsonic flow
[NASA-TM-72755] N77-33103

Subsonic longitudinal aerodynamic characteristics and engine pressure distributions for an aircraft with an integrated scramjet designed for Mach 6 cruise
[NASA-TM-X-73911] N77-33108

Spin-tunnel investigation of the spinning characteristics of typical single-engine general aviation airplane designs. 1. Low-wing model A: Effects of tail configurations
[NASA-TP-1009] N77-33111

Theoretical parametric study of the relative advantages of winglets and wing-tip extensions
[NASA-TP-1020] N77-33112

Transonic wind-tunnel investigation of the maneuver potential of the NASA supercritical wing concept, phase 1
[NASA-TM-X-3534] N77-33115

Transonic aerodynamic characteristics of a supercritical-wing transport model with trailing-edge controls
[NASA-TM-X-3431] N77-33116

Transonic aerodynamic characteristics of a supercritical-wing transport model with trailing-edge controls, supplement, part 1
[NASA-TM-X-3431-PT-1] N77-33117

Transonic aerodynamic characteristics of a supercritical-wing transport model with trailing-edge controls
[NASA-TM-X-3431-PT-2] N77-33118

Transonic aerodynamic characteristics of a supercritical-wing transport model with trailing edge controls
[NASA-TM-X-3431-PT-3] N77-33119

Transonic aerodynamic characteristics of a supercritical-wing transport model with trailing-edge controls
[NASA-TM-X-3431-PT-4] N77-33120

An elementary analysis of the effect of sweep, Mach number, and lift coefficient on wing-structure weight
[NASA-TM-74072] N77-33146

Behavior of aircraft antiskid breaking systems on dry and wet runway surfaces: A slip-ratio-controlled system with ground speed reference from unbraked nose wheel
[NASA-TN-D-8455] N77-33150

A suspended anemometer system for measuring true airspeed on low-speed airplanes
[NASA-TN-D-8523] N77-33157

Flow-field surveys on the windward side of the NASA 040A space shuttle orbiter at 31 deg angle of attack and Mach 20 in helium
[NASA-TM-X-3560] N77-33236

Entry dynamics of space shuttle orbiter with longitudinal stability and control uncertainties at supersonic and hypersonic speeds
[NASA-TP-1084] N77-33259

Investigation of supersonic turbulent boundary-layer separation on a compression ramp by an integral method
[NASA-TM-74065] N77-33439

Experimental design studies and flow visualization of proportional laminar-flow fluidic amplifiers
[NASA-TN-D-8433] N77-33442

Demonstration of rapid-scan two-dimensional laser velocimetry in the Langley Vortex Research Facility for research in aerial applications
[NASA-TM-74081] N77-33497

The use of lidar for stratospheric measurements
[NASA-TM-74085] N77-33498

A summary of the test procedures and operational details of an ocean dumping pollution monitoring experiment conducted 7 October 1976
[NASA-TM-74066] N77-33579

Standardization, certification, maintenance, and dissemination of large scale engineering software systems
[NASA-CP-2015] N77-33876

Mossbauer effect studies in iron containing nonmagnetic impurities
[NASA-TM-74067] N77-34018

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LEWIS RESEARCH CENTER, CLEVELAND, OHIO.

Nonlinear aeroelastic equations for combined flapwise bending, chordwise bending, torsion, and extension of twisted nonuniform rotor blades in forward flight
[NASA-TM-74059] N77-33107

Progress in advanced high temperature turbine materials, coatings, and technology
[NASA-TM-X-73628] N77-33159

Steady-state unbalance response of a three-disk flexible rotor on flexible, damped supports
[NASA-TM-X-73666] N77-33160

Over-the-wing model thrust reverser noise tests
[NASA-TM-73495] N77-33161

Identification and measurement of combustion noise from a turbofan engine using correlation and coherence techniques
[NASA-TM-73747] N77-33162

Measurement of far field combustion noise from a turbofan engine using coherence functions
[NASA-TM-73748] N77-33163

Improved computer programs for calculating potential flow in propulsion system inlets
[NASA-TM-73728] N77-33164

Output feedback regulator design for jet engine control systems
[NASA-TM-73776] N77-33165

State-of-the-art of turbofan engine noise control
[NASA-TM-73734] N77-33166

Minimum time acceleration of aircraft turbofan engines by using an algorithm based on nonlinear programming
[NASA-TM-73741] N77-33167

F100 multivariable control synthesis program: Evaluation of a multivariable control using a real-time engine simulation
[NASA-TP-1056] N77-33169

Propellant management report for the Titan Centaur TC-5 extended mission
[NASA-TM-73749] N77-33232

Early performance of the 12-GHz, 200-watt transmitter experiment package in the communications technology satellite
[NASA-TM-X-3555] N77-33258

Recent advances in lightweight, filament-wound composite pressure vessel technology
[NASA-TM-73699] N77-33265

Lean premixed/prevaporized combustion
[NASA-CP-2016] N77-33297

Burner rig alkali salt corrosion of several high temperature alloys
[NASA-TM-X-73659] N77-33313

The 100,000-hour cyclic oxidation behavior at 815C [1500 F] of 33 high-temperature alloys
[NASA-TM-73707] N77-33316

X-Ray photoelectron spectroscopy study of radiofrequency-sputtered titanium, carbide, molybdenum carbide, and titanium boride coatings and their friction properties
[NASA-TP-1033] N77-33348

Friction and deformation behavior of single-crystal silicon carbide
[NASA-TP-1053] N77-33350

Fundamental considerations for future solid lubricants
[NASA-TM-X-52659] N77-33351

Vapor ingestion in Centaur liquid-hydrogen tank
[NASA-TP-1061] N77-33444

Lubrication of high-speed, large bore tapered-roller bearings
[NASA-TM-X-73673] N77-33517

Design considerations in mechanical face seals for improved performance. 2: Lubrication
[NASA-TM-73736] N77-33518

Effect of double vacuum melting and retained austenite on rolling-element fatigue life of AMS 5749 bearing steel
[NASA-TP-1060] N77-33520

Ductility normalized-strainrange partitioning life relations for creep-fatigue life predictions
[NASA-TM-73737] N77-33536

Description and review of global measurements of atmospheric species from GASP
[NASA-TM-73781] N77-33720

A Weibull characterization for tensile fracture of multicomponent brittle fibers
[NASA-TM-73790] N77-33929

A hollow cathode hydrogen ion source
[NASA-TM-73783] N77-33999

Alternative approaches to plasma confinement
[NASA-TM-X-73793] N77-34000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALA.

Earth resources-regional transfer activity contracts review
[NASA-TM-78130] N77-33578

A prediction model to forecast the cost impact from a break in the production schedule
[NASA-TM-78131] N77-34044

NATIONAL BUREAU OF STANDARDS, BOULDER, COLO.

Time and frequency user's manual
[PB-269220/0] N77-33952

NATIONAL BUREAU OF STANDARDS, WASHINGTON, D. C.

The measurement of fabric flammability parameters in movement simulation experiments
[PB-268902/4] N77-33309

Estimation of net enthalpies of combustion of some aviation fuels expressed in the international system of units [SI]
[NBS-TN-937] N77-33370

Performance of branch circuit electrical terminations of copper and aluminum non-metallic sheathed cable
[PB-267221/0] N77-33434

An approach for managing an energy conservation program
[AD-A041086] N77-33614

Transpiration heat transfer in thermal energy storage devices
[PB-267281/4] N77-33616

Window design strategies to conserve energy
[PB-269297/8] N77-33669

Building energy conservation programs: A preliminary examination of regulatory activities at the state level
[PB-268873/7] N77-33673

Self-study manual on optical radiation measurements. Part 1: Concepts, chapter 6. Distribution of optical radiation with respect to polarization
[PB-268502/2] N77-33977

Critical evaluation of data in the physical sciences. A status report on the national standard reference data system, January 1977
[PB-268513/9] N77-34040
Life cycle costing: Case studies
[PB-268162/5] N77-34047

NATIONAL CENTER FOR ATMOSPHERIC RESEARCH, BOULDER, COLO.
Weather forecasting and weather forecasts: Models, systems and users. Volume 2: Notes from a colloquium
[PB-268914/9] N77-33775
Weather forecasting and weather forecasts: Models, systems, and users. Volume 1: Notes from a colloquium
[PB-268913/1] N77-33776

NATIONAL ENERGY INFORMATION CENTER, WASHINGTON, D. C.
Energy interrelationships. A handbook of tables and conversions factors for combining and comparing international energy data
[PB-269034/5] N77-33675

NATIONAL ENVIRONMENTAL SATELLITE SERVICE, WASHINGTON, D. C.
Atlantic tropical and subtropical cyclone classification for 1976
[PB-269674/8] N77-33768

NATIONAL GAS TURBINE ESTABLISHMENT, FARNBOROUGH [ENGLAND].
The effect of flight on the noise of subsonic jets
[AD-A041730] N77-33176

NATIONAL GEOPHYSICAL AND SOLAR-TERRESTRIAL DATA CENTER, BOULDER, COLO.
Solar-geophysical data number 392. Part 1: Prompt Reports
[PB-268660/8] N77-34090

NATIONAL INST. FOR OCCUPATIONAL SAFETY AND HEALTH, CINCINNATI, OHIO.
Abrasion resistance of safety lenses. Effects of abrasion on toughened safety glass and plastic lenses with respect to their optical properties
[PB-267399/4] N77-33367

NATIONAL INST. FOR OCCUPATIONAL SAFETY AND HEALTH, MORGANTOWN, W. VA.
Industrial sound level meter internal noise in octave bands test
[PB-268952/9] N77-33963

NATIONAL INSTITUTES OF HEALTH, BETHESDA, MD.
Effect of prolonged space flight on cardiac function and dimensions
N77-33815

NATIONAL LEAGUE OF CITIES, WASHINGTON, D. C.
A user's guide to the System/3 data base management system [S3DBMS]
[PB-268875/2] N77-33874

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, BOULDER, COLO.
Mariners weather log, volume 21, number 2
[PB-268219/3] N77-33755
Computer software for the assessment of growth histories of weather radar echoes
[PB-268753/1] N77-33764
Raindrop size distributions and Z-R relationships measured on the NOAA DC-6 and the ship Researcher within the GATE B-scale array
[PB-269659/9] N77-33769

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, WASHINGTON, D. C.
US national processing center for GATE: B-scale surface meteorological and radiation system, including instrumentation, processing, and archived data
[PB-268816/6] N77-33766
GATE convection subprogram data center: Comparison of ship-surface, rawinsonde, and tethered sonde wind measurements
[PB-268848/9] N77-33767
US national processing center for GATE: B-scale precipitation data
[PB-270222/3] N77-33770

NATIONAL TRANSPORTATION SAFETY BOARD, WASHINGTON, D. C.
Aircraft accident report. Midair collision. Reeds Aviation, Inc., Piper PA-28R-200, N7941C, and Piper-28-181, N8592C, near Huntsville, Missouri, 24 July 1976
[NTISUB/C/104-002] N77-33133

NATIONAL WEATHER SERVICE, FORT WORTH, TEX.
An examination of probability of precipitation forecasts in light of rainfall areal coverage
[PB-268761/4] N77-33758
A comparison of the frequency distribution of four-hour totals of manually digitized radar data with flooding over a portion of the Southeastern United States
[PB-268872/9] N77-33760

NATIONAL WEATHER SERVICE, SALT LAKE CITY, UTAH.
Moisture distribution modification by upward vertical motion
[PB-268740/8] N77-33763

NATIONAL WEATHER SERVICE, SILVER SPRING, MD.
Automated prediction of thunderstorms and severe local storms
[PB-268035/3] N77-33753
Operations of the National Weather Service
[PB-268041/1] N77-33754
Greatest known areal storm rainfall depths for the contiguous United States
[PB-268871/1] N77-33759
Analysis of cool season lake-related mesoscale phenomena using numerical variational analysis
[PB-269619/3] N77-33771
Gulfstream: Monthly publications, January-December 1976. Volume 2, numbers 1-12
[PB-268216/9] N77-33779

NAVAL CIVIL ENGINEERING LAB., PORT HUENEME, CALIF.
The biodegradation of oil in sea water for naval pollution control
[AD-A042375] N77-33688

NAVAL CONSTRUCTION RESEARCH ESTABLISHMENT, DUNFERMLINE [SCOTLAND].
Elastic plate buckling using finite elements
[NCRE/R627] N77-33532
Plane grillage suite of programs
[NCRE/R637] N77-33533
Static and dynamic response calculations for the new Coulport launcher piston assembly
[NCRE/N206] N77-33534

NAVAL ELECTRONIC SYSTEMS COMMAND, WASHINGTON, D. C.
An introduction to the theory of linear systems
[AD-A042690] N77-33939

NAVAL POSTGRADUATE SCHOOL, MONTEREY, CALIF.
Initial unsteady aerodynamic measurements of a circulation controlled airfoil and an oscillating flow wind tunnel
[AD-A042102] N77-33122
An analysis of personnel parachutes for use by Marine Corps Force Reconnaissance Units
[AD-A041151] N77-33124
Human factors engineering considerations in designing Naval aircraft for maintainability
[AD-A041156] N77-33153
Wing rock as a lateral-directional aircraft limit cycle oscillation induced by nonlinear aerodynamics occurring at high angle of attack
[AD-A042104] N77-33204
Laser induced desorption of gas from stainless steel surfaces
[AD-A042323] N77-33325
On the stability of two basic parallel flows: Analysis, progress report and proposal for further research
[AD-A041946] N77-33450
A hydrogen fluoride/deuterium flouride laser at the Naval Postgraduate School
[AD-A042341] N77-33505
An analysis of earthquake frequency data
[AD-A035813] N77-33722
Statistical diagnostic modeling of marine fog using model output parameters
[AD-A042059] N77-33748
A numerical experiment of the development of the zonally symmetric northern summer monsoon
[AD-A042103] N77-33749
Design of an electrohydraulic wave follower system
[AD-A042317] N77-33778
Investigation of card programmable and chip programmable packet calculators and calculator systems for use at Naval Post-graduate School and in the naval establishment
[AD-A041067] N77-33870
An application of CP/CMS to the time series analysis
[AD-A041178] N77-33878
Bayesian decision theory in variables sampling for quality control
[AD-A042117] N77-33930
An application of Markovian chains in manpower planning
[AD-A042304] N77-34032

NAVAL RESEARCH LAB., WASHINGTON, D. C.
Experimental investigation of the characteristics of Pc1 micropulsation propagation using a midlatitude five-station receiving network
[AD-A040265] N77-33392
Superconducting magnetic calibration source for magnetic anomaly detection MAD operations
[AD-A041738] N77-33421
Geophysical fluid dynamics background for ocean thermal power plants
[DSE/1005-1] N77-33624
Comments on certain boundary layer parameterization schemes used in atmospheric circulation models
[AD-A042057] N77-33731
Revised and enlarged collection of plasma physics formulas and data
[AD-A041545] N77-34006
Formation and adiabatic compression of reversed-field theta pinches in imploding liners
[AD-A041737] N77-34007

NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER, BETHESDA, MD.
Stability and control of ground effect aircraft in longitudinal motion
[AD-A042005] N77-33205
Numerical treatment of arbitrarily-shaped regions in fluid dynamics
[AD-A041741] N77-33451
CSKYTI: An out-of-core Cholesky algorithm equation solver [with respect to profile] for the Texas Instruments' Advanced Scientific computer
[AD-A042807] N77-33923

NAVAL SURFACE WEAPONS CENTER, WHITE OAK, MD.
Wundy calculations of the collapse velocities of a staged imploding cylinder
[AD-A041064] N77-33541

NAVAL TRAINING EQUIPMENT CENTER, ORLANDO, FLA.
Optical analysis of a multicolor model of the 360 degree nonprogrammed visual display
[AD-A042092] N77-33499

NAVAL UNDERWATER SYSTEMS CENTER, NEW LONDON, CONN.
An addition formula for Green's functions
[AD-A041667] N77-33913

NAVAL WEAPONS STATION, YORKTOWN, VA.
A safety, quality and cost effectiveness study of composition A3 press loading parameters,2
[AD-A041078] N77-33383

NEBRASKA UNIV., LINCOLN.
Application of LANDSAT imagery in land use inventory and classification in Nebraska
[E77-10242] N77-33573
Arithmetical semigroup rings
N77-33948

NEW MEXICO STATE UNIV., LAS CRUCES.
Relations among Kubelka-Munk coefficients and absorption and scattering coefficients of powders
[AD-A041110] N77-33300

NEW MEXICO UNIV., ALBUQUERQUE.
Literature review of the remote sensing of natural resources
[NASA-CR-155190] N77-33551
Solar energy: Policy and prospects
[PB-267986/8] N77-33620

NEW ORLEANS UNIV., LA.
A study of the hemin heterogeneous rate constant in non-aqueous solvents with on-line coulostatic system
N77-33275

NEW YORK UNIV., N. Y.
Polymerization of methyl methacrylate initiated by t-butyl hydroperoxide in the presence of metal acetylacetonates
N77-33338
The economic determinants of waste oil recycling
N77-33597
Investigations on approximate quantum mechanical wave functions for first period atoms and molecules
N77-33964

NORTH CAROLINA SCIENCE AND TECHNOLOGY RESEARCH CENTER, RESEARCH TRIANGLE PARK.
The BIOSIS data base: Evaluation of its indexes and the STRATBLDR, CHEMFILE, STAIRS and DIALOG systems for on-line searching
[NASA-CR-2893] N77-33869

NORTH CAROLINA STATE UNIV., RALEIGH.
Application of satellite remote sensing to North Carolina. Development of a monitoring methodology for trophic states of lakes in North Carolina
[NASA-CR-150419] N77-33590
Development of a hydrologic information storage and retrieval system
[PB-268792/9] N77-33765

NORTH CAROLINA UNIV., CHAPEL HILL.
A study of power transforms
[AD-A041985] N77-33912
On the reconstruction of the covariance of stationary Gaussian processes observed through zero memory nonlinearities
[AD-A041812] N77-33934

NORTHROP CORP., DES PLAINES, ILL.
Low cost crossed-field amplifier
[AD-A042666] N77-33425

NORTHROP RESEARCH AND TECHNOLOGY CENTER, HAWTHORNE, CALIF.
Optical coatings 2-6 microns
[AD-A041130] N77-33971

NORTHWESTERN UNIV., EVANSTON, ILL.
Wind load requirements for buildings
[PB-268547/7] N77-33385
Geometrical problems with a position sensitive detector employed on a diffractometer: Its use in the measurement of stress
[AD-A041102] N77-33484
A portable residual stress analyzer
[AD-A041831] N77-33542

NORWEGIAN WATER RESOURCES AND ELECTRICITY BOARD, OSLO.
Snowmapping in southern Norway by use of LANDSAT imagery
[E77-10241] N77-33572

NOTRE DAME UNIV., IND.
UNDSAFE-I: A computer code for buoyant flow in an enclosure
[PB-267278/0] N77-33476

O

OAK RIDGE ASSOCIATED UNIVERSITIES, TENN.
Net energy from nuclear power
[IAEA-CN-36/399] N77-33676
OAK RIDGE GASEOUS DIFFUSION PLANT, TENN.
Derivation of conservative finite difference expressions for the Navier-Stokes equations
[K/CSD-5] N77-33455
OAK RIDGE NATIONAL LAB., TENN.
Role of stress effects in the oxidation behavior of high temperature alloys
[CONF-761057-4] N77-33333
TEHM: A Terrestrial Ecosystem Hydrology Model
[EDFB-IBP-76-8] N77-33592
Design report for the ACES demonstration house
[ORNL-CON-1] N77-33641
Improved engineering-economic model of residential energy use
[ORNL-CON-8] N77-33644
Technical and economic studies of small reactors for supply of electricity and steam
[IAEA-CN-36/398] N77-33678
Reflections of regional environmental systems
[ORNL-RUS-26] N77-33695
Survey of nuclear fuel cycle economics: 1970 - 1985
[ORNL-TM-5703] N77-33968
OAK RIDGE Y-12 PLANT, TENN.
Properties of thermally contracting tantalum tungstate
[Y-2071] N77-33306
Corrosion behavior of aluminum in water
[Y-DA-7055] N77-33334
Use of a microprocessor-based interactive system to increase production of printed wiring board artwork
[SAND-77-8503] N77-33431
Applications of the dimensional-measuring laser interferometer in the Oak, Ridge Y-12 Plant Gage Laboratory
[Y-2070] N77-33510
Ultraprecise parabolic interpolator for numerically controlled machine tools
[REPT-40004] N77-33529
Study of the relationships of three factors on errors in inspection
[Y-2075] N77-33531
Compilation of documented computer codes applicable to environmental assessment of radioactivity releases
[ORNL-TM-5830] N77-33691
Discrete event approach to pollutant transport and vegetation effects
[ORNL-CSD-TM-11] N77-33694
OAKLAND UNIV., ROCHESTER, MICH.
Direct determination of flexural strains in plates using projected gratings
[AD-A041917] N77-33537
OFFICE NATIONAL D'ETUDES ET DE RECHERCHES AEROSPATIALES, PARIS [FRANCE].
Wind tunnel study of an active flutter suppression system
N77-33215
OFFICE NATIONAL D'ETUDES ET DE RECHERCHES AEROSPATIALES, TOULOUSE [FRANCE].
Prediction of onset and development of boundary layer transition
[AAAF-NT-77-03] N77-33470
OFFICE OF NAVAL RESEARCH, LONDON [ENGLAND].
Conference on Luminescence Processes in Cathode-ray Tubes and lamps
[AD-A041443] N77-33412
From Soup to Nuts: The 7th International Congress on Rheology
[AD-A041227] N77-33445
OFFICE OF TELECOMMUNICATIONS, BOULDER, COLO.
Earth-space attenuation prediction procedures at 4 to 16 GHz
[PB-269228/3] N77-33402
OGDEN AIR LOGISTICS CENTER, HILL AFB, UTAH.
Propellant surveillance report LGM-30 F and G stage. Phase E: Series 3, TP-H1011
[AD-A041671] N77-33373
OHIO STATE UNIV., COLUMBUS.
Studies of crystal field, temperature, and concentration effects on the lowest triplet states of aromatic molecules in mixed single crystals
N77-33292
Stimulated raman scattering in methane with Nd YAG pump
[AD-A042391] N77-33507
An improved formulation for extending the geometrical theory of diffraction by the moment method
[AD-A041775] N77-33972
OKLAHOMA STATE UNIV., STILLWATER.
Development of a stability monitor/controller for material handling equipment. Phase 2: Hardware development
[AD-A041192] N77-33524
Predicting changes in land-use patterns resulting from water resource investment using a nonstationary Markov process
[PB-269409/9] N77-33595
OKLAHOMA UNIV., NORMAN.
Research initiation: Mixed and hybrid finite element analysis of problems in structural mechanics
[PB-268300/1] N77-33550
A numerical study of the diurnal variation of the low-level jet
[PB-269484/2] N77-33772
A severe storm forecast and intercept project
[PB-269485/9] N77-33773
OLD DOMINION UNIV., NORFOLK, VA.
The Role of Aerospace Technology in Agriculture. The 1977 Summer Faculty Fellowship Program in Engineering Systems Design
[NASA-CR-145218] N77-33580
OLD DOMINION UNIV. RESEARCH FOUNDATION, NORFOLK, VA.
Computations in turbulent flows and off-design performance predictions for airframe-integrated scramjets
[NASA-CR-155053] N77-33438
OMNEMII, INC., VIENNA, VA.
Development of a continuous performance measure for manual control
[AD-A041676] N77-33900
OREGON STATE UNIV., CORVALLIS.
Gas phase X-ray photoelectron spectroscopy of compounds containing multiply-bonded oxygen
N77-33278
Stereophotogrammetric reconnaissance of ocean wave/sea ice interaction
N77-33552
ORGANIZATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, PARIS [FRANCE].
World energy supply and demand and the future of nuclear power
[IAEA-CN-36/583] N77-33680

P

PACIFIC ENVIRONMENTAL SERVICES, INC., SANTA MONICA, CALIF.
Reliability study of vapor recovery systems at service stations
[PB-267613/8] N77-33700
PANAMETRICS, INC., WALTHAM, MASS.
Total ozone derived from UV spectrophotometer measurements on the NASA CV-990 aircraft for the fall 1976 latitude survey flights
[NASA-CR-135276] N77-33684
PENNSYLVANIA DEPT. OF COMMUNITY AFFAIRS, HARRISBURG.
Reclamation of energy from solid waste: Theory and practice. A selected, annotated bibliography for Pennsylvania local government officials
[PB-267800/1] N77-33621
PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
Experimental and theoretical investigation of three-dimensional turbulent boundary layers and turbulence characteristics inside an axial flow inducer passage
[NASA-CR-2888] N77-33106
Synthesis of alkyl and aryl phosphazene high polymers
[AD-A042449] N77-33368
Surface charge kinetics near metal-dielectric interfaces exposed to kilovolt electron flux
[NASA-CR-155195] N77-33411
The energy balance of the nighttime thermosphere
[NASA-CR-155194] N77-33721
PENNSYLVANIA UNIV., PHILADELPHIA.
Development of intercalated graphite materials
[AD-A041214] N77-33270
PENNWALT CORP., KING OF PRUSSIA, PA.
The synthesis and characterization of the poly[metal phosphinates]
[AD-A041511] N77-33357
Crystal structure and magnetic studies of bis[mu-dibutylphosphinato] copper [II]
[AD-A041510] N77-34020
PERCEPTRONICS, INC., WOODLAND HILLS, CALIF.
Computer-based supervisory system for managing information flow in C3 systems: Pacing model
[AD-A040359] N77-33391
An interactive computer aiding system for group decision making
[AD-A041758] N77-34030
PISA UNIV. [ITALY].
Testing simulation of damages occurred in service
N77-33194
PITTSBURGH UNIV., PA.
The coulometric dissolution and electrochemical behavior of titanium anodes in methanol
N77-33276
Gas phase reactions of OH radicals studied by molecular resonance fluorescence
N77-33283
Hydrogen solubility in rare earth intermetallic compounds
N77-33288
The paleomagnetism of the Palisade Sill and the development of the arm correction method of paleointensity determination
N77-33711
Intermetallic compounds containing lanthanides [studies of magnetic anisotropy]
[AD-A041947] N77-34023
The division of information processing labor between user and support system: Exploration of a concept
N77-34035
PLANNING SYSTEMS AND SCIENCES CO., IRVINE, CALIF.
New model framework and structure and the commonality evaluation model
[NASA-CR-155157] N77-33249
POITIERS UNIV. [FRANCE].
Exploratory study of turbulence in air intakes
[AAAF-NT-77-17] N77-33471
POLYTECHNIC INST. OF NEW YORK, BROOKLYN.
A study of beam couplers for integrated optics
[AD-A042070] N77-33970
POPE, EVANS, AND ROBBINS, INC., NEW YORK.
Building energy handbook. Volume 1: Methodology for energy survey and appraisal
[ERDA-76-163/1-VOL-1] N77-33658
Building energy handbook. Volume 2: Forms for energy survey and appraisal
[ERDA-76-163/2-VOL-2] N77-33659
PRATT AND WHITNEY AIRCRAFT, WEST PALM BEACH, FLA.
Accelerated mission test: A vital reliability tool
N77-33196
PRATT AND WHITNEY AIRCRAFT GROUP, WEST PALM BEACH, FLA.
Mechanical properties of several nickel alloys in hydrogen at elevated temperatures
[NASA-CR-150412] N77-33315
PRINCETON UNIV., N. J.
Optimization and characteristics of a Sailwing windmill rotor
[NSF/RANN/GI-41891/FR/75/4] N77-33652
Physics studies for TFTR
[TID-27494] N77-34010
PROTOTYPE DEVELOPMENT ASSOCIATES, INC., SANTA ANA, CALIF.
A general three-dimensional computational model for nonlinear composite structures and materials
[AD-A041413] N77-33269
PUBLIC SERVICE SATELLITE CONSORTIUM, DENVER, COLO.
Earth station design at 12/14 GHz
[NASA-CR-152597] N77-33234
PURDUE RESEARCH FOUNDATION, LAFAYETTE, IND.
The effects of substrate composition on thick film circuit reliability
[AD-A041572] N77-33416
PURDUE UNIV., LAFAYETTE, IND.
Propulsion nozzle studies. Volume 2: Design of maximum thrust nozzle-base-boattail contours
[AD-A041530] N77-33174
A shock tube study of the H2/02/CO/AR and H2/N2O/CO/Ar systems
[AD-A041340] N77-33299
Coherent structure of a turbulent boundary layer in a convected reference frame
[AD-A041751] N77-33448
Applications of remote sensing
[E77-10183] N77-33553
Application of remote sensing technology to the solution of problems in the management of resources in Indiana
[E77-10223] N77-33554
Minimax subset selection with applications to unequal variance problems
[AD-A041744] N77-33917
On slippage tests and multiple decision [selection and ranking] procedures
[AD-A041746] N77-33933

R

RADIAN CORP., AUSTIN, TEX.
Evaluation of continuous monitoring sites in EPA Region 6
[PB-269223/4] N77-33701
RAND CORP., SANTA MONICA, CALIF.
An evaluation of very large airplanes and alternative fuels: Executive summary
[AD-A042112] N77-33154
Standard spacecraft economic analysis. Volume 1: Executive summary
[NASA-CR-152538] N77-33224
Standard spacecraft economic analysis. Volume 2: Findings and conclusions
[NASA-CR-152539] N77-33225

Advanced composites: Electromagnetic properties, vulnerabilities, and protective measures
[AD-A042043] N77-33272
Europe's changing energy relations
[R-2086-ISA] N77-33610
RAYTHEON CO., WALTHAM, MASS.
Development of low-cost hardened zinc selenide for IR windows
[AD-A042147] N77-33974
RCA ADVANCED TECHNOLOGY LABS., CAMDEN, N. J.
Design definition of a mechanical capacitor
[NASA-CR-152613] N77-33603
RCA LABS., PRINCETON, N. J.
Basic adhesion mechanisms in thick and thin films
[AD-A041959] N77-33366
RENSSELAER POLYTECHNIC INST., TROY, N. Y.
Polymer-solvent interactions and diffusion in constrained elastomers
N77-33337
Numerical solution of a class of random boundary value problems
N77-33909
RHODE ISLAND UNIV., KINGSTON.
Temperature programmed exchange studies of supported metal catalysts
N77-33281
RICE UNIV., HOUSTON, TEX.
Ionosphere/microwave beam interaction study
[NASA-CR-151517] N77-33389
Special relativity and the conventionality of simultaneity
N77-34027
ROCHESTER UNIV., N. Y.
Testing significance of a mean vector: A possible alternative to Hotellings T squared
[AD-A042644] N77-33920
ROCKWELL INTERNATIONAL CORP., ANAHEIM, CALIF.
Development of low cost, high reliability sealing techniques for hybrid microcircuit packages, phase 2
[NASA-CR-150420] N77-33349
ROCKWELL INTERNATIONAL CORP., COLUMBUS, OHIO.
Evaluation of composite wing for XFV-12A airplane
[AD-A041208] N77-33152
ROCKWELL INTERNATIONAL CORP., LOS ANGELES, CALIF.
Design and development of a structural mode control system
[NASA-CR-143846] N77-33201
ROME AIR DEVELOPMENT CENTER, GRIFFISS AFB, N.Y.
The present technology of impulse radars
[AD-A042094] N77-33394
ROSENSTIEL SCHOOL OF MARINE AND ATMOSPHERIC SCIENCES, CORAL GABLES, FLA.
Relationship between lake-induced disturbances and synoptic circulation
[PB-269406/5] N77-33741
ROSENSTIEL SCHOOL OF MARINE AND ATMOSPHERIC SCIENCES, MIAMI, FLA.
Meteorological forcing fields of the New York bight
[PB-269442/0] N77-33774
ROYAL INST. OF TECH., STOCKHOLM [SWEDEN].
Finite-difference methods for plane steady inviscid transonic flows
[TRITA-GAD-2] N77-33109
On the role of magnetic mirroring in the auroral phenomena
[NASA-CR-155144] N77-33717
Problems related to macroscopic electric fields in the magnetosphere
[TRITA-EPP-77-08] N77-33736
Electric field topology near the dayside magnetopause
[TRITA-EPP-77-12] N77-33737
Criticism of reconnection models of the magnetopause
[TRITA-EPP-77-13] N77-33738
Dynamics of a coaxial plasma gun
[TRITA-EPP-77-02] N77-34014
On the stability of ballooning modes in the boundary layer of a gas insulated plasma
[TRITA-PFU-77-04] N77-34015
ROYAL NORWEGIAN COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH, TRONDHEIM.
Noise induced hearing loss. Noise evaluation. The use of hearing protectors
[NTNF-4] N77-33852

S

SAN JOSE STATE UNIV., CALIF.
Vestibular-visual interactions in flight simulators
[NASA-CR-155200] N77-33847
SANDIA LABS., ALBUQUERQUE, N. MEX.
PFLASH: A program to calculate Fourier cosine coefficients for pressure distributions
[SAND-76-0280] N77-33456
Alignment technique for locating the reflected signal of an infrared laser off a remote target
[SAND-76-0671] N77-33511
Evaluation of design safety factors for time-dependent buckling
[SAND-76-0721] N77-33547
Sandia Laboratories energy programs
[SAND-77-0034] N77-33629
Solar radiation availability for New Mexico
[SAND-77-0004] N77-33654
Optical properties of chemically sprayed CdS/Cu/sub x/S photovoltaic cells
[SAND-76-0729] N77-33656
Collection of equations for low-degree least-squares polynomials
[SAND-76-0648] N77-33927
SCHOOL OF AEROSPACE MEDICINE, BROOKS AFB, TEX.
Psychometric characteristics of astronauts
[AD-A039228] N77-33855
SCIENCE APPLICATIONS, INC., LA JOLLA, CALIF.
Two-dimensional numerical model of the nearfield flow for an ocean thermal power plant. Part 3: Manual for the computer code NRFL02
[DSE/1005-7] N77-33623
SCIENCE APPLICATIONS, INC., PASADENA, CALIF.
Martian polar geological studies
[NASA-CR-155160] N77-34069
Geologic investigation of Mercury data and the subsequent mapping and explanation of the quadrangle area H-12
[NASA-CR-155159] N77-34070
Geology orbiter comparison study
[NASA-CR-155056] N77-34073
SCIENCE APPLICATIONS, INC., ROLLING MEADOWS, ILL.
Advanced planetary studies
[NASA-CR-155055] N77-34072
SCIENCE APPLICATIONS, INC., SCHAUMBURG, ILL.
Advanced planetary studies
[NASA-CR-155054] N77-34071
SCIENTIFIC TRANSLATION SERVICE, SANTA BARBARA, CALIF.
Analysis of air accidents involving airplanes or helicopters of various types of application
[NASA-TT-F-17443] N77-33128
Notes on the pollution of airplanes and helicopters by chemicals during agricultural jobs
[NASA-TT-F-17444] N77-33129
Retention of selected physiological indicators in pilots in the course of agricultural flights
[NASA-TT-F-17441] N77-33845
Activity of the digestive system during 49-day antiorthostatic human hypokinesia
[NASA-TM-75177] N77-33846
SCOTT ENVIRONMENTAL TECHNOLOGY, INC., PLUMSTEADVILLE, PA.
Evaluation of continuous monitors for carbon monoxide in stationary sources
[PB-268861/2] N77-33708
SELSKAPET FOR INDUSTRIELL OG TEKNISK FORSKNING, TRONDHEIM [NORWAY].
Reservoir flow: Two-phase incompressible flow
[STF71-A74038] N77-33461
FLOW 22: Users's description
[STF71-A75003] N77-33462
Numerical solutions of the Buckley-Leverett problem
[STF71-A75024] N77-33463
A finite element model for the analysis of waterflood performance
[STF71-A75036] N77-33464
WFLOOD: Users's description. A simulation model for oil reservoirs subjected to waterflooding
[STF71-A76005] N77-33465
Immiscible flow by finite elements
[STF71-A76017] N77-33466
GASSIM. User's description: A gas reservoir simulation model
[STF71-A76020] N77-33467
SERVICE DES ETUDES DE PROPULSION, PARIS [FRANCE].
Risks affecting the structural resistance and integrity of modern propulsion systems
N77-33187
SHAKER RESEARCH CORP., BALLSTON LAKE, N. Y.
Underground coal mine instrumentation and test
[NASA-CR-150045] N77-33479
Fundamentals of gas lubrication
[AD-A041163] N77-33523
SIKORSKY AIRCRAFT, STRATFORD, CONN.
Performance flight tests of the RH-53D design growth configuration
[SER-651316] N77-33143
Handling qualities of the RH-53D in the design growth configuration
[SER-651317] N77-33144
SOCIETE NATIONALE D'ETUDES ET DE CONSTRUCTION DE MOTEURS D'AVIATION, MOISSY-CRAMAYEL [FRANCE].
CFM56 turbofan maintainability and reliability-oriented development
N77-33189
Sophistication and reliability
N77-33191
Progress in determining service life by endurance tests
N77-33195
SOLAR, SAN DIEGO, CALIF.
Design and development of a major engine component [compressor] for a 60 kW turbine generator set
[AD-A041717] N77-33525
SOUTH CAROLINA UNIV., COLUMBIA.
Raman spectra of molecules with anharmonic vibrations in the gaseous and solid phases
N77-33287
SOUTH DAKOTA SCHOOL OF MINES AND TECHNOLOGY, RAPID CITY.
Thin film atomic hydrogen detectors
[NASA-CR-152605] N77-33482
SOUTH DAKOTA STATE UNIV., BROOKINGS.
Application of remote sensing in South Dakota to provide accurate inventories of agricultural crops, enhance contrast in photographic products, monitor rangeland habitat loss, map Aspen, and prepare hydrogeologic surveys
[E77-10237] N77-33568
SOUTHWEST RESEARCH INST., SAN ANTONIO, TEX.
Study of liquid jet impingement on screens
[NASA-CR-135260] N77-33437
Analysis of film thickness effect in slow-speed lightly-loaded elastrohydrodynamic contacts. Part 3: Experimental measurement of lubricant film thickness
[AD-A041205] N77-33522
SOUTHWESTERN LOUISIANA UNIV., LAFAYETTE.
Periodic rings
N77-33947
SPECTRA OPTICS, SYLMAR, CALIF.
Ephemeral active regions during the solar minimum. 1: General properties and trends over the solar cycle. 2: Characteristics of individual ephemeral regions
[AD-A038124] N77-34086
SPERRY UNIVAC, ST. PAUL, MINN.
Magneto-optic development for laser beam steering
[AD-A042985] N77-33509
SPRINGBORN LABS., INC., ENFIELD, CONN.
Investigation of test methods, material properties and processes for solar cell encapsulants
[NASA-CR-155158] N77-33347
Wash water waste pretreatment system
[NASA-CR-151513] N77-34048
STANFORD RESEARCH INST., MENLO PARK, CALIF.
Evaluation methodology for federal motor vehicle safety standards. Volume 1: Executive summary
[PB-266936/4] N77-33381
Evaluation methodology for federal motor vehicle safety standards. Volume 2: Technical findings
[PB-266937/2] N77-33382
Reduced state viterbi detector demonstration
[AD-A041712] N77-33396
Analysis of radar detection of agitated metals [RADAM]
[AD-A041713] N77-33397
Field ionization for laser isotope separation
[EPRI-NP-334] N77-33512
Collisional dissociation and structural properties of atmospheric negative ions
[AD-A042111] N77-33730
STANFORD UNIV., CALIF.
Feasibility analysis of gravitational experiments in space
[NASA-CR-155148] N77-33223
Air/undersea communication at ultra-low-frequencies using airborne loop antennas
[AD-A042132] N77-33395
Performance analysis of computer communication networks via random access channels
[AD-A041982] N77-33893
Computer visual systems for exploratory research
N77-33895
Passage time distribution for a class of queueing networks: closed, open, or mixed, with different classes of customers with applications to computer system modeling
[AD-A042723] N77-33945
A review of knowledge based problem solving as a basis for a genetics experiment designing system
[AD-A042720] N77-33946
STATE UNIV. OF NEW YORK, ALBANY.
Synthesis of 1,9,10-anthyridines and annelation fo 1,8-naphthyridine units via Friedlander condensation
N77-33341
SYRACUSE UNIV., N. Y.
Fatigue crack growth at elevated temperature 316 stainless steel and H-13 steel
[NASA-CR-135105] N77-33314
Coupling through rotationally symmetric apertures in cavities of revolution
[AD-A042093] N77-33390
New capabilities of Walsh functions and Walsh transforms
[AD-A041748] N77-33916
Optimal control of birth and death processes and queues
[AD-A042123] N77-33944

SYSTEM DEVELOPMENT CORP., SANTA MONICA, CALIF.
An investigation of programming practices in selected Air Force projects
[AD-A041678] N77-33885
SYSTEMS TECHNOLOGY, INC., MOUNTAIN VIEW, CALIF.
Researcher's guide to the NASA Ames Flight Simulator for Advanced Aircraft [FSAA]
[NASA-CR-2875] N77-33230

T

TECHNICAL AUDIT ASSOCIATES, INC., NEW YORK.
An assessment of the linkage of research in electrochemistry with its ramifications for industry
[PB-269224/2] N77-33311
TECHNICAL UNIV. OF NORWAY, TRONDHEIM.
Airplane noise: Dimensions and means of noise reduction
[ELAB-STF44-A75080] N77-33696
Need for noise standards
[ELAB-STF44-A75044] N77-33962
TECHNION - ISRAEL INST. OF TECH., HAIFA.
Nonlinear anelastic behavior of a synthetic rubber at finite strains
[AD-A041777] N77-33363
TECHNISCHE HOCHSCHULE, AACHEN [WEST GERMANY].
Experimental investigation on the influence of component faults on turbojet engine performance
N77-33197
TECHNISCHE HOCHSCHULE, DARMSTADT [WEST GERMANY].
Interactive system design considerations
[PU1R2/76] N77-33863
Writing structured programs in dialog mode
[PU1R4/74] N77-33887
Writing reliable programs
[PU1R4/75] N77-33888
First study of job control languages
[PU1R3/76] N77-33889
TECHNISCHE UNIV., BERLIN [WEST GERMANY].
Theoretical and experimental investigations on shock waves in gas-solid flows
[ILR-18] N77-33468
TECHNISCHE UNIVERSITAET, BRUNSWICK [WEST GERMANY].
Measurements of the influence of static and dynamic interference on an ILS-receiver and measurement of the capture effect with the double frequency procedure
[TUBS/SFB58/50] N77-33140
TECHNO-SCIENCES, INC., ANNAPOLIS, MD.
Tornado detection data reduction and analysis
[NASA-CR-152595] N77-33742
TEMPLE UNIV., PHILADELPHIA, PA.
Pyrazinecarboxylate, isomeric pyridiniumcarboxylates and isomeric nitrobenzoates as bridging ligands in electron transfer reactions
N77-33295
On measures of dependence: A survey of recent developments
[AD-A041814] N77-33915
TENNESSEE UNIV., KNOXVILLE.
Low temperature fluorine chemistry of electronegative elements
[AD-A041439] N77-33298
TENNESSEE UNIV. SPACE INST., TULLAHOMA.
Investigation of feasible nozzle configurations for noise reduction in turbofan and turbojet aircraft. Volume 3: Shrouded slot nozzle configurations
[AD-A041782] N77-33179
TEXACO, INC., MONTEBELLO, CALIF.
Hydrogen production from coal liquefaction residues
[EPRI-AF-233] N77-33374
TEXAS A&M UNIV., COLLEGE STATION.
Radiative transfer in spherical shell atmospheres. 2: Asymmetric phase functions
[NASA-CR-155162] N77-33443
Spectral measurement of watershed coefficients in the southern Great Plains
[E77-10225] N77-33556
Feasibility study of microprocessor systems suitable for use in developing a real-time for the 4.75 GHz scatterometer
[NASA-CR-151522] N77-33586
Review policies and their effect on journal quality
[PB-267602/1] N77-34039
Bachman treatment facility for excessive storm flow in sanitary sewers
[PB-269128/5] N77-34060
TEXAS TECHNOLOGICAL UNIV., LUBBOCK.
A Bayesian model for determining the optimal test stress for a single test unit
[AD-A041232] N77-33530
Improved seat, console, and workplace design: Annotated bibliography, integration of the literature, accommodation model, and seated operator reach profiles
[AD-A040479] N77-33857
TEXAS UNIV., AUSTIN.
The effect of grain size on thermal diffusion in metals
[AD-A041532] N77-33321
Dynamic scene analysis: The study of moving images
[AD-A042124] N77-33901
TEXAS UNIV., GALVESTON.
Cytogenetic studies of blood, experiment M111
N77-33804
TEXTRON BELL AEROSPACE CO., BUFFALO, N. Y.
Unsteady supersonic aerodynamic theory for interfering surfaces by the method of potential gradient
[NASA-CR-2898] N77-33121
Cathodic kinetics during corrosion of 5456-H117 aluminum alloy by high velocity sea water
[AD-A041218] N77-33320
TOKYO UNIV. [JAPAN].
Investigation of environmental change pattern in Japan. Classification of shorelines
[E77-10224] N77-33555
Investigation of environmental change pattern in Japan. Utilization of LANDSAT-2 data for fisheries
[E77-10227] N77-33558
Application of LANDSAT MSS data to the study of oceanographical environment
[E77-10228] N77-33559
Significant applications of LANDSAT-2 MSS data to marine environment
[E77-10229] N77-33560
General pattern of the turbid water in the Seto-inland sea extracted from multispectral imageries by the LANDSAT-1 and 2
[E77-10230] N77-33561
Environmental change pattern in central Japan as revealed by LANDSAT data
[E77-10231] N77-33562
Investigation of environmental change pattern in Japan. Investigation of variations in the prominent oceanic current, Kuroshio
[E77-10232] N77-33563
Investigation of environmental change pattern in Japan. Observation of present state of agricultural land-use by analysing LANDSAT data
[E77-10243] N77-33574
Investigation of environmental change pattern in Japan. Investigation of the ecological environment index from observation of the regional vegetation cover and their growing condition
[E77-10244] N77-33575
An analysis on vegetation cover by using LANDSAT MSS data
[E77-10245] N77-33576
TRANSPORTATION SYSTEMS CENTER, CAMBRIDGE, MASS.
Requirements for flight testing automated terminal service
[AD-A041975] N77-33137
Energy statistics: A supplement to the summary of national transportation statistics
[PB-269301/8] N77-33672
TRI-STATE REGIONAL PLANNING COMMISSION, NEW YORK.
Methods used to estimate air pollutant emissions 1974, 1980, and 2000. New Jersey, New York: Connecticut air quality control region
[PB-269667/2] N77-33706
TRW DEFENSE AND SPACE SYSTEMS GROUP, REDONDO BEACH, CALIF.
Planning and design of additional East Mesa Geothermal Test Facilities. Phase 1B, Volume 2: Procurement package
[SAN/1140-1/2-VOL-2] N77-33657
The software design and verification system [SDVS]
[AD-A042126] N77-33884
TRW, INC., CLEVELAND, OHIO.
Air bonded, FOD resistant metal matrix fan blades
[AD-A041492] N77-33170
TRW SYSTEMS GROUP, MCLEAN, VA.
Consumer thermal energy storage costs for residential hot water, space heating and space cooling systems
[ANL-K-76-3364-1] N77-33631
Systems studies of energy conservation: Methane produced from coalbeds, volume 1
[MERC/CR-77/4-VOL-1] N77-33660
Systems studies of energy conservation: Methane produced from coalbeds, volume 2
[MERC/CR-77/4-VOL-2] N77-33661
TULSA UNIV., OKLA.
Secondary sources of seismic noise
N77-33714

U

UNIROYAL, INC., MISHAWAKA, IND.
Investigation of coating compounds and adhesives for self-supporting collapsible fuel storage tanks
[AD-A042653] N77-33369
UNITED TECHNOLOGIES RESEARCH CENTER, EAST HARTFORD, CONN.
Development of a three-dimensional combustor flow analysis. Volume 3: User's manual for the MINT computer code
[AD-A041351] N77-33173
Development of a three-dimensional combustor flow analysis. Volume 2: Theoretical studies
[AD-A042122] N77-33302
Pressureless sintering of SiAlon gas turbine components
[AD-A041207] N77-33353
Preliminary feasibility evaluation of compressed air storage power systems, volume 1
[CONS/NSF/42-1] N77-33636
UNIVERSITE DES SCIENCES ET TECHNIQUES DE LILLE [FRANCE].
Transient turbulent flow visualization by ultrafast chronophotography
[AAAF-NT-77-22] N77-33125
UNIVERSITY OF SOUTHERN CALIF., LOS ANGELES.
Incentives for the commercialization of Ocean Thermal Energy Conversion Technology [OTEC]
[PB-268097/3] N77-33665
Incentives for the commercialization of Ocean Thermal Energy Conversion technology [OTEC], executive summary
[PB-268096/5] N77-33666
Reversible intermolecular energy transfer between chromium [3] complexes in fluid solution
[AD-A040661] N77-33966
UNIVERSITY OF SOUTHERN CALIF., MARINA DEL REY.
Informality in program specifications
[AD-A041069] N77-33879
UTAH STATE UNIV., LOGAN.
Suspended and dissolved solids effects on freshwater biota: A review
[PB-269180/6] N77-33707
UTAH UNIV., SALT LAKE CITY.
Raman scattering studies of chain orientation in hydrostatically extruded polypropylene
[AD-A041096] N77-33356
Computer program for determining the thermodynamic properties of light hydrocarbons
[UTEC-ME-76-211] N77-33376

V

VANDERBILT UNIV., NASHVILLE, TENN.
Vectorcardiographic changes during extended space flight [M093]: Observations at rest and during exercise
N77-33813
VARIAN ASSOCIATES, PALO ALTO, CALIF.
Millimeter wave gyrotron development, phase 1
[AD-A041596] N77-33415
Extended bandwidth VTS-5753B1 coupled cavity traveling wave tube
[AD-A041564] N77-33417
Indium phosphide Gunn devices, 26-40 GHz
[AD-A041329] N77-33418
VARIAN ASSOCIATES, SAN CARLOS, CALIF.
Manufacturing methods and technology [MMTE] measure for fabrication of low voltage start sealed beam arc lamps
[AD-A041517] N77-33414
VEREINIGTE FLUGTECHNISCHE WERKE-FOKKER G.M.B.H., BREMEN [WEST GERMANY].
Methods of improving the performance reliability of advanced military power plant systems
N77-33198
Impact of a command and stability augmentation system on gust response of a combat aircraft
N77-33210
VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG.
Three dimensional steady and unsteady asymmetric flow past wings of arbitrary planforms
[NASA-CR-145235] N77-33102
Digital flight control systems
[NASA-CR-145246] N77-33200
Theory of ultrasonic diffraction by damage developed in thin laminated composites
[NASA-CR-155161] N77-33266
Estimating the lag in a nonlinear time series model
[AD-A042451] N77-33921
Measuring non-stationarity in the parameters of a linear model with applications to asset returns
[AD-A042137] N77-33938
Accessibility applications in urban transportation
[PB-269240/8] N77-34059
VIRGINIA UNIV., CHARLOTTESVILLE.
The development of a model for predicting passenger acceptance of short-haul air transportation systems
[NASA-CR-145250] N77-33148
Development of finite element models for the earth's gravity field. Phase 1: Macrogravity model for satellite orbit integration
[AD-A038463] N77-33728

Error behavior of multistep methods applied to unstable differential systems
[NASA-CR-155199] N77-33941

W

WAPORA, INC., CHARLESTON, ILL.
Economic impact of proposed amendment to water pollution regulations for hexane extractable materials, R74-1, 8, 9
[PB-269184/8] N77-33709
WASHINGTON UNIV., SEATTLE.
An experimental investigation of shock wave-turbulent boundary layer interactions with and without boundary layer suction: A data summary report
[NASA-CR-2872] N77-33440
Optical fiber cutting machine for rectangular and circular fibers
[AD-A041506] N77-33521
WASHINGTON UNIV., ST. LOUIS, MO.
A treatment of the subject of tearing instability
[PB-270277/7] N77-33335
WEAPONS RESEARCH ESTABLISHMENT, ADELAIDE [AUSTRALIA].
An accurate angular position and angular velocity instrument based on an optical incremental encoder
[WRE-TN-1730[WR/D]] N77-33480
Investigations of small scale structure of ionisation in the D region using a Langmuir probe
[WRE-TR-1816[W]] N77-33718
WEAPONS RESEARCH ESTABLISHMENT, SALISBURY [AUSTRALIA].
Upper atmosphere research bibliography of contaminant release experiments, part 3
[AD-A042565] N77-33733
WESTINGHOUSE ELECTRIC CORP., HORSEHEADS, N. Y.
Manufacturing methods and engineering for TFT addressed display
[AD-A041754] N77-34022
WESTINGHOUSE ELECTRIC CORP., PITTSBURGH, PA.
Investigation of metal processing operations
[AD-A042188] N77-33326
Development of current limiter using vacuum arc current commutation. Phase 1: A feasibility study for using arc instability in vacuum for current limitation
[EPRI-EL-393] N77-33427
Analysis and forecast of electrical distribution system materials. Volume 3: Appendix
[CONS/2050-1-VOL-3-APP] N77-33430
Study of the auxiliaries for lead-acid battery systems for peaking power
[CONS/2114-3] N77-33634
WISCONSIN UNIV., MADISON.
The understanding of molecular properties by both experimental and theoretical methods: The localized molecular orbitals of transition metal complexes, and the ionization potentials of n-alkenes N77-33284

Island dissolution phase transition in a chemisorbed layer
[AD-A042444] N77-33303
Regular multivalued functions and algorithmic applications N77-33904
A boundary value control problem for hyperbolic systems N77-33908
Apriori estimates of higher order derivatives of solutions to the FitzHugh-Magumo equations
[AD-A042694] N77-33922
Recovery of middle components of human auditory averaged electroencephalic response N77-33953
WOLF RESEARCH AND DEVELOPMENT CORP., RIVERDALE, MD.
Calibration results for the GEOS-3 altimeter
[NASA-CR-141430] N77-33261

X

XEROX ELECTRO-OPTICAL SYSTEMS, PASADENA, CALIF.
Thermal energy storage demonstration unit for Vuilleumier cryogenic cooler
[AD-A040895] N77-33613

Y

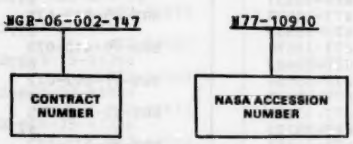
YARDNEY ELECTRIC CORP., PAWCATUCK, CONN.
Design and cost study of a zinc/nickel oxide battery for electric vehicle propulsion
[ANL-K-76-3543-1] N77-33635

Typi

Listings i
Under eac
ments tha
contract
denotes th

AF PROJ.
AF PROJ.
AF PROJ.
AF PROJ.
AF PROJ.
AF PROJ.
AF PROJ.
AF PROJ.
AF-AFOSR-
AF-AFOSR-
AF-AFOSR-
AF-AFOSR-
AF-AFOSR-
AF-AFOSR-
AF-AFOSR-
AF-AFOSR-
AF-AFOSR-
AF-AFOSR-
AF-AFOSR-
AF-AFOSR-
AF-AFOSR-
AF-AFOSR-
ARO PROJ.
ARPA ORDE
ARPA ORDE
ARPA ORDE
ARPA ORDE
ARPA ORDE
ARPA ORDE

Typical Contract Number Index Listing



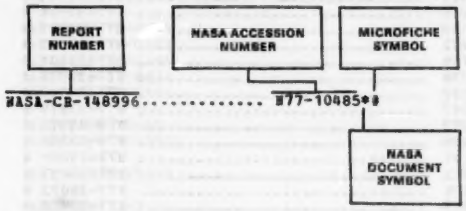
Listings in this index are arranged alphanumerically by contract number. Under each contract number the NASA accession numbers denoting documents that have been produced as a result of research done under that contract are arranged in ascending order. The NASA accession number denotes the number by which the citation is identified.

AF PROJ. 486U N77-33354
AF PROJ. 2304 N77-33897
AF PROJ. 2305 N77-33397
AF PROJ. 2307 N77-33267
AF PROJ. 4027 N77-33485
AF PROJ. 6813 N77-33317
AF PROJ. 7231 N77-33686 N77-33850
AF PROJ. 7340 N77-33268
AF PROJ. 7351 N77-33170
AF-AFOSR-0800-77 N77-33883
AF-AFOSR-2342-72 N77-33321
AF-AFOSR-2524-73 N77-33454
AF-AFOSR-2607-74 N77-33363
AF-AFOSR-2610-74 N77-33500
AF-AFOSR-2627-74 N77-33944
AF-AFOSR-2796-75 N77-33912 N77-33934
AF-AFOSR-2809-75 N77-33916
AF-AFOSR-2837-75 N77-33915
AF-AFOSR-2854-75 N77-33919
AF-AFOSR-2858-75 N77-33914
AF-AFOSR-2958-76 N77-33903
AF-AFOSR-2968-76 N77-33206
AF-AFOSR-3180-77 N77-33931
AF-AFOSR-3213-77 N77-33942
AF-AFOSR-3360-77 N77-33920
ARO PROJ. P32A-G2A N77-33219
ARPA ORDER C-192 N77-33415
ARPA ORDER 1733 N77-33395
ARPA ORDER 1975 N77-33729
ARPA ORDER 2223 N77-33879
ARPA ORDER 2543 N77-33871 N77-33881
ARPA ORDER 3052 N77-34045
ARPA ORDER 3091 N77-33880
ARPA ORDER 3200 N77-33391
ARPA ORDER 3206 N77-33902
ARPA ORDER 3344 N77-34030
ARPA ORDER-3206 N77-33898
DA PROJ. 1F2-62209-AH-76 N77-33101 N77-33207
DA PROJ. 1L1-61102-B-53A N77-33724 N77-33725 N77-33732
DA PROJ. 1L2-6311-D-157 N77-33155
DA PROJ. 1T1-61101-A-91 N77-33241
DA PROJ. 1T1-61101-A-91A N77-33352 N77-33726
DA PROJ. 1W1-62118-AH-75 N77-33544
DA PROJ. 4A7-62719-AT-41 N77-33546
DA-ARO(D)-31-124-73-G96 N77-33298
DA-ARO(D)-31-124-73-G160 N77-33323
DAAA08-75-C-0130 N77-33527
DAAA21-72-C-0679 N77-33965
DAAB07-72-C-0259 N77-33872
DAAB07-74-C-0109 N77-33611
DAAB07-75-C-1327 N77-33436
DAAB07-75-C-1343 N77-33425
DAAB07-76-C-0027 N77-34022
DAAB07-76-C-0038 N77-33414
DAAB07-76-C-0041 N77-33423
DAAB07-76-C-1301 N77-33419
DAAB07-76-C-1352 N77-33420
DAAG29-74-G-0098 N77-33507
DAAG29-75-C-0024 N77-33922
DAAG29-76-G-0077 N77-33300
DAAG29-76-G-0090 N77-34023
DAAG29-76-G-0123 N77-33477
DAAG29-76-G-0140 N77-33507
DAAG29-76-G-0177 N77-33322
DAAG39-76-C-0086 N77-33896
DAAG53-76-C-0067 N77-33728
DAAG53-76-C-0138 N77-33898 N77-33902
DAAG53-76-C-0140 N77-33369
DAAG53-76-C-0141 N77-33359
DAAG53-76-C-0144 N77-33524
DAAJ02-75-C-0015 N77-33132
DAAJ02-75-C-0025 N77-33207
DAAK02-73-C-0398 N77-33525
DACA88-75-C-0004 N77-33539
DAHC04-74-G-0102 N77-34023
DAHC04-74-G-0127 N77-33322
DAHC04-74-G-0183 N77-33323
DAHC04-76-G-0018 N77-33323
DAHC07-74-C-0031 N77-33730
DAHC15-67-C-0158 N77-33610
DAHC15-72-C-0308 N77-33879
DAHC15-73-C-0200 N77-33617
DAHC15-73-C-0435 N77-33946
DARPA ORDER 3012 N77-33502
DASG60-77-C-0073 N77-33893 N77-33945
DCA100-76-C-0037 N77-33396
DI-14-31-0001-5020 N77-33593
DI-14-31-0001-5033 N77-33765
DI-14-31-0001-5056 N77-33702
DI-14-31-0001-5105 N77-33595
DNA001-77-C-0009 N77-34008
DOT-FA72WA-3053 N77-33179
DOT-FA74WA-3445 N77-33135
DOT-FH-11-7876 N77-34057
DOT-FH-11-8746 N77-34057
DOT-HS-6-01513 N77-33381 N77-33382
DOT-HS-356-3-719 N77-33866 N77-33891
DOT-OST-30034 N77-33175
DOT-TSC-707-6 N77-33136
DREE-74/607 N77-33180
DREE-74/632 N77-33473
DREE-76/1047 N77-33471 N77-33473
E(04-3)-1140 N77-33657
E(46-1)-8042 N77-33660 N77-33661
E(49-1)-3800 N77-33669
E(49-18)-2050 N77-33430
E(49-18)-2114 N77-33634
E(49-18)-2469 N77-33650
E(49-18)-2477 N77-33628
E(49-20)-1009 N77-34007
E(49-26)-1005 N77-33623 N77-33624
EPA-R-800427 N77-33687
EPA-R-802160 N77-33703
EPA-68-01-3188 N77-33662
EPA-68-01-3210 N77-34051
EPA-68-02-0632 N77-33705
EPA-68-02-1383 N77-33701
EPA-68-02-1400 N77-33708
EPA-68-02-1405 N77-33700
EPA-68-02-2096 N77-33706
EPA-68-03-2190 N77-34055
EPA-68-03-2334 N77-34058
EPRI PROJ. 78-441 N77-33426
EPRI PROJ. 506-3 N77-33512
EPRI PROJ. 564-1 N77-33427
EPRI PROJ. 714-1 N77-33374
EPRI PROJ. 7824 N77-33432
EPRI PROJ. 7842-1 N77-33433
EX-76-C-01-1824 N77-33432
EX-76-C-01-2114 N77-33634
EX-76-C-10-3853 N77-33658 N77-33659
EY-76-C-01-0016 N77-33328
EY-76-C-02-0016 N77-33426 N77-33638 N77-33690 N77-34038 N77-34054
EY-76-C-02-0041 N77-33377 N77-33378
EY-76-C-02-2864 N77-33626
EY-76-C-02-3073 N77-34010
EY-76-C-03-0701 N77-33637
EY-76-C-03-1140 N77-33657
EY-76-C-04-0789 N77-33431 N77-33456 N77-33511 N77-33547 N77-33629 N77-33654 N77-33656 N77-33927
EY-76-C-06-1830 N77-33653
EY-76-C-07-1570 N77-33384 N77-33489
EY-76-E-14-2170 N77-33332

EY-76-S-02-2305 N77-34026
EY-76-S-02-2581 N77-33625
EY-76-S-02-2917 N77-33627
EY-76-S-02-2983 N77-33645
EY-76-S-02-2988 N77-33692
EY-76-S-07-1523 N77-33376
F04701-76-C-0077 N77-33301 N77-33446 N77-33515 N77-33528 N77-33723 N77-33727
F19628-75-C-0016 N77-34080
F19628-76-C-0075 N77-33729
F19628-76-C-0081 N77-34086
F19628-76-C-0190 N77-33243
F19628-76-C-0214 N77-33244
F19628-77-C-0001 N77-33435
F29601-74-C-0055 N77-33171
F29601-75-C-0120 N77-33386
F30602-75-C-0121 N77-33390
F30602-75-C-0246 N77-33485
F30602-76-C-0180 N77-33885
F30602-76-C-0232 N77-33417
F30602-76-C-0237 N77-33415
F30602-76-C-0284 N77-33413
F33615-73-C-2010 N77-33174
F33615-73-C-2031 N77-33177
F33615-73-C-4013 N77-34025
F33615-74-C-1159 N77-33884
F33615-74-C-2028 N77-33173 N77-33302
F33615-74-C-5059 N77-33326
F33615-75-C-1099 N77-33509
F33615-75-C-2045 N77-33613
F33615-75-C-3016 N77-33354
F33615-75-C-5052 N77-33178
F33615-75-C-5088 N77-33900
F33615-75-C-5113 N77-33268
F33615-75-C-5116 N77-33364
F33615-75-C-5131 N77-33974
F33615-75-C-5222 N77-33170
F33615-75-C-5231 N77-33270
F33615-75-C-5249 N77-33540
F33615-76-C-0507 N77-33685 N77-33686
F33615-76-C-5023 N77-33522
F33657-71-C-0163 N77-33156
F33657-72-C-0850 N77-33263
F33657-74-C-0716 N77-33358
F40600-75-C-0001 N77-33227
F44620-74-C-0012 N77-33848
F44620-75-C-0030 N77-33849
F44620-75-C-0046 N77-33397
F44620-76-C-0001 N77-33317
F44620-76-C-0022 N77-33924
F44620-76-C-0030 N77-33267
F44620-76-C-0089 N77-33901
F44620-76-C-0099 N77-33448
F49620-77-C-0023 N77-33154
HSM-99-73-92 N77-33851
HUD-H-2196R N77-33874 N77-34056
JPL-953984 N77-33601
JPL-954524 N77-33223
JPL-954527 N77-33347
JPL-954681 N77-33249
NDA903-74-C-0083 N77-33871 N77-33881
NDA903-76-C-0241 N77-33391
NDA903-77-C-0184 N77-34030
NDA930-76-C-0274 N77-33217
NAS5-11279 N77-34083
NASW-2558 N77-33584
NASW-2613 N77-34073
NASW-2783 N77-34072
NASW-2790 N77-33410 N77-33583 N77-33956
NASW-2791 N77-33128 N77-33129 N77-33845 N77-33846
NASW-2800 N77-33683
NASW-2883 N77-33969
NASW-2885 N77-34069
NASW-2893 N77-34071
NASW-2900 N77-34070
NASW-3047 N77-33221
NASW-3066 N77-33969
NAS1-11257 N77-33387
NAS1-13129 N77-33387 N77-34083
NAS1-13148 N77-33535
NAS1-13383 N77-33202 N77-33203
NAS1-13416 N77-33960
NAS1-13599 N77-33100
NAS1-13815 N77-33585
NAS1-13916 N77-33255 N77-33256
NAS1-13939 N77-33105
NAS1-13943 N77-33260
NAS1-13986 N77-33121
NAS1-14151 N77-33149
NAS1-14208 N77-33869
NAS1-14650 N77-33296
NAS1-14667 N77-33147
NAS2-8685 N77-33840
NAS2-8687 N77-33839
NAS2-9024 N77-33230
NAS2-9432 N77-34061
NAS3-18284 N77-33114
NAS3-18560 N77-33168
NAS3-19556 N77-33483
NAS3-19749 N77-33113
NAS3-19776 N77-33608 N77-33609
NAS3-20086 N77-33437
NAS3-20095 N77-33222
NAS3-20472 N77-33684
NAS4-2347 N77-33201
NAS5-11063 N77-34084
NAS5-11344 N77-34085
NAS5-11431 N77-33387 N77-34083
NAS5-11999 N77-33237 N77-33591
NAS5-20456 N77-33257
NAS5-20814 N77-33573
NAS5-20907 N77-33569
NAS5-20937 N77-33570
NAS5-22475 N77-33602
NAS5-22534 N77-33556
NAS5-22873 N77-33607
NAS5-23376 N77-33224 N77-33225
NAS5-23470 N77-33482
NAS5-23481 N77-33262
NAS5-23508 N77-33742
NAS5-23649 N77-33719
NAS5-23650 N77-33603
NAS5-23696 N77-33409
NAS5-23734 N77-33251
NAS5-23834 N77-33234
NAS5-23840 N77-33250
NAS6-2520 N77-33577
NAS6-2639 N77-33261
NAS7-100 N77-33229 N77-33233 N77-33235 N77-33249 N77-33347 N77-33519 N77-33601 N77-33604 N77-33867 N77-33875 N77-33911 N77-34074 N77-34075 N77-34076 N77-34077 N77-34078 N77-34079 N77-34080 N77-34081 N77-34082
NAS8-30566 N77-34067
NAS8-30744 N77-33315
NAS8-31417 N77-33516
NAS8-31574 N77-33248
NAS8-31668 N77-33479
NAS8-31979 N77-33589
NAS8-31984 N77-33590
NAS8-31992 N77-33349
NAS8-32200 N77-33379 N77-33380
NAS9-12200 N77-33481 N77-33581 N77-33582
NAS9-13247 N77-33253 N77-33254
NAS9-13940 N77-33388
NAS9-14248 N77-33837
NAS9-14345 N77-33605 N77-33606
NAS9-14958 N77-33238 N77-33239
NAS9-14965 N77-34048
NAS9-14970 N77-33553
NAS9-14973 N77-33838
NAS9-15212 N77-33389
NAS9-15311 N77-33586
NBS-G-7-9002 N77-33476
NBS-4-9019 N77-33310
NBS-6-9011 N77-33865
NBS-6-9013 N77-33854
NGL-05-046-002 N77-33847
NGL-15-005-186 N77-33554
NGL-16-001-002 N77-33387
NGL-16-001-043 N77-33387 N77-34083
NGL-21-002-033 N77-33710
NGL-39-009-003 N77-33721
NGL-39-009-007 N77-33106
NGL-42-003-007 N77-33568
NGL-48-002-047 N77-33440
NGR-05-003-478 N77-33264
NGR-09-010-078 N77-33145
NGR-17-002-072 N77-33104
NGR-22-009-735 N77-33226
NGR-33-022-157 N77-33214
NGR-44-001-117 N77-33443
NGR-47-004-090 N77-33102
NGR-47-004-116 N77-33200
NGR-47-005-181 N77-33148
NGT-47-003-028 N77-33580
NIH-RR-00785 N77-33946
NOAA-04-5-022-23 N77-33741
NOAA-04-6-022-44002 N77-33772
NOAA-04-6-022-44010 N77-33774
NOAA-04-6-022-44024 N77-33773
NR PROJ. 017-653 N77-34019
NR PROJ. 031-733 N77-33542
NR PROJ. 356-408 N77-34020
NR PROJ. 388-002 N77-33747
NRC-03-77-029 N77-33335
NRL PROJ. A03-16 N77-34006
NSF AEM-07749-A02 N77-33476
NSF AER-73-03291 N77-33619
NSF AER-74-00242 N77-33636
NSF AER-75-00826 N77-33667
NSF AER-75-01039 N77-33376
NSF AG-381 N77-33426
NSF APR-75-18249 N77-33620
NSF APR-75-18339 N77-33618
NSF ATA-07749-A01 N77-33476
NSF ATM-76-14916 N77-33738
NSF ATR-75-18279 N77-33665 N77-33666
NSF C-760 N77-33775 N77-33776
NSF C-866 N77-34062
NSF C-1044 N77-33674
NSF DES-75-13310 N77-33756 N77-33762
NSF ENG-73-04104 N77-33452
NSF ENG-74-21258 N77-33543
NSF ENG-75-10265 N77-33550
NSF ENG-76-02302 N77-33385
NSF ERS-76-21350 N77-34052

NSF ERT-71-01885-A03 N77-33762
NSF GDSI-76-15422 N77-34039
NSF GI-37191 N77-33476
NSF GI-39924 N77-34031
NSF GI-41891 N77-33652
NSF IA-AAA-E-4-79 N77-33695
NSF INA-AG-199 N77-33592
NSF ISR-75-20393 N77-33663
NSF MCS-73-03488 N77-33872
NSF MCS-75-17385 N77-33922
NSF MCS-75-22255 N77-33918
NSF MCS-76-11649 N77-33946
NSF MCS-76-11935 N77-33946
NSF OCD-72-01681 N77-33973
NSF OCD-72-01681-A03 N77-33740
NSF OCD-74-21678 N77-33740 N77-33973
NSF PRA-75-21960 N77-33674
NSF PRM-77-SP-0553 N77-33311
NSG-1254 N77-33266
NSG-1301 N77-33957 N77-33958 N77-33959
NSG-1335 N77-33941
NSG-1348 N77-33438
NSG-3097 N77-33411
NSG-5106 N77-33587
NTNF-B-1840.4683 N77-33463 N77-33467
N00014-67-A-04-38-0014 N77-33970
N00014-67-A-0204-0075 N77-33886
N00014-69-C-0122 N77-33357 N77-34020
N00014-74-C-0278 N77-33523
N00014-75-C-0192 N77-33747
N00014-75-C-0258 N77-33399
N00014-75-C-0421 N77-33970
N00014-75-C-0455 N77-33917 N77-33933
N00014-75-C-0494 N77-33921 N77-33938
N00014-75-C-0529 N77-33943
N00014-75-C-0580 N77-33484 N77-33542
N00014-75-C-0652 N77-33934
N00014-75-C-0661 N77-33892
N00014-75-C-0685 N77-33368
N00014-75-C-0729 N77-33940 N77-34046
N00014-75-C-0832 N77-33530
N00014-75-C-0860 N77-33543
N00014-75-C-0908 N77-33356
N00014-75-C-0955 N77-33361 N77-33362
N00014-75-C-0982 N77-33424
N00014-75-C-1087 N77-33320 N77-33324
N00014-75-C-1095 N77-33395
N00014-75-C-1123 N77-33502
N00014-75-C-1143 N77-33299
N00014-75-C-8056 N77-33365
N00014-76-C-0016 N77-34083
N00014-76-C-0020 N77-34021
N00014-76-C-0050 N77-33967 N77-34019
N00014-76-C-0074 N77-34045
N00014-76-C-0099 N77-34024
N00014-76-C-0161 N77-33269
N00014-76-C-0363 N77-33452
N00014-76-C-0370 N77-33918
N00014-76-C-0476 N77-33880
N00014-76-C-0487 N77-33537
N00014-76-C-0548 N77-33966
N00014-76-C-0573 N77-33972
N00014-76-C-0608 N77-33935 N77-33936 N77-33937
N00014-76-C-0659 N77-33360
N00014-76-C-0682 N77-33882
N00014-76-C-0707 N77-33372
N00014-76-C-0727 N77-33303
N00014-77-C-0299 N77-33932 N77-33942
N00019-74-C-0183 N77-33143 N77-33144
N00019-77-C-0176 N77-33366
N00019-77-C-0327 N77-33416
N00025-76-C-0011 N77-33422
N00123-76-C-0265 N77-33418
N00123-76-C-1321 N77-33971
N00123-76-C-1451 N77-33521
N61756-75-M-2986 N77-33857
N62269-74-C-0577 N77-33152
N62269-76-C-0108 N77-33353
N62269-76-C-0199 N77-33158
N66001-76-M-1163 N77-33526
N68305-76-C-0009 N77-33615
OWRT PROJ. A-028-ND(1) N77-33593
PROJ. SQUID N77-33299
PROJ. 788-1 N77-33622
RR0000110 N77-33722
SR0140301 N77-33923
V-101C-266 N77-33670
W-31-109-ENG-38 N77-33548 N77-33631 N77-33633 N77-33635 N77-33649
W-7405-ENG-26 N77-33306 N77-33333 N77-33334 N77-33455 N77-33458 N77-33510 N77-33529 N77-33531 N77-33592 N77-33641 N77-33644 N77-33691 N77-33694 N77-33695 N77-33968
W-7405-ENG-36 N77-33400 N77-33646 N77-33693 N77-33734 N77-33735 N77-33851 N77-33976
W-7405-ENG-48 N77-33305 N77-33329 N77-33330 N77-33331 N77-33457 N77-33639 N77-33640 N77-33647 N77-33655 N77-33873 N77-33894 N77-33925 N77-33926 N77-34011 N77-34012
ZF52551713 N77-33748
ZF57571001 N77-33615
176-30-31-11 N77-33579
198-30-04-02 N77-33498
366-00-00 N77-33868
386-01-00-00-72 N77-34050
491-02 N77-33444
501-06-43-03 N77-33497
505-02-14-01 N77-33876
505-02-25 N77-33201
505-02-31-02 N77-34018
505-03-32 N77-33168
505-04 N77-33520
505-05 N77-33169
505-06-11-02 N77-33439
505-06-15-02 N77-33103
505-06-97 N77-33110
505-07-41-06 N77-33157
505-08-22 N77-33130
505-08-31-01 N77-33150
505-10-11-03 N77-33104
505-10-11-07 N77-33111
505-10-26-01 N77-33107
505-15-22-01 N77-33102
506-16 N77-33348 N77-33350
506-26-30-04 N77-33236 N77-33259
512-52-02-01 N77-33442
514-52-01 N77-33105
517-51-03-00 N77-33115
610-22 N77-33258
743-01-13-01 N77-33145
754-62-01-06 N77-33116
791-40-08-01 N77-33112

Typical Report/Accession Number Index Listing



Listings in this index are arranged alphanumerically by report number. The NASA accession number denotes the number by which the citation is identified. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche. Accession numbers followed by a plus sign (+) are not available on microfiche because of size or reproducibility.

A-6968 ..... N77-33110*#
A-7072 ..... N77-33868*#
A-7116 ..... N77-33130*#

AAAF-NT-77-03 ..... N77-33470 #
AAAF-NT-77-07 ..... N77-33473 #
AAAF-NT-77-17 ..... N77-33471 #
AAAF-NT-77-18 ..... N77-33474 #
AAAF-NT-77-19 ..... N77-33126 #
AAAF-NT-77-20 ..... N77-33180 #
AAAF-NT-77-21 ..... N77-33472 #
AAAF-NT-77-22 ..... N77-33125 #

AAE-77-4 ..... N77-33454 #

AD-A035682 ..... N77-33216 #
AD-A035813 ..... N77-33722 #
AD-A035939 ..... N77-34088 #
AD-A036172 ..... N77-33611 #
AD-A036570 ..... N77-33317 #
AD-A038124 ..... N77-34086 #
AD-A038208 ..... N77-33849 #
AD-A038442 ..... N77-33218 #
AD-A038463 ..... N77-33728 #
AD-A038782 ..... N77-34087 #
AD-A038822 ..... N77-34083*#
AD-A039000 ..... N77-33848 #
AD-A039228 ..... N77-33855 #
AD-A040162 ..... N77-33965 #
AD-A040265 ..... N77-33392 #
AD-A040345 ..... N77-33352 #
AD-A040359 ..... N77-33391 #
AD-A040390 ..... N77-33242 #
AD-A040479 ..... N77-33857 #
AD-A040625 ..... N77-33856 #
AD-A040661 ..... N77-33966 #
AD-A040736 ..... N77-33612 #
AD-A040895 ..... N77-33613 #
AD-A041011 ..... N77-33172 #
AD-A041016 ..... N77-33453 #
AD-A041031 ..... N77-33877 #
AD-A041063 ..... N77-33227 #
AD-A041064 ..... N77-33541 #
AD-A041067 ..... N77-33870 #
AD-A041069 ..... N77-33318 #
AD-A041074 ..... N77-33896 #
AD-A041077 ..... N77-33726 #
AD-A041078 ..... N77-33383 #
AD-A041081 ..... N77-33725 #
AD-A041085 ..... N77-33724 #
AD-A041086 ..... N77-33614 #
AD-A041088 ..... N77-33446 #
AD-A041096 ..... N77-33356 #
AD-A041099 ..... N77-33747 #
AD-A041102 ..... N77-33484 #
AD-A041107 ..... N77-33540 #
AD-A041110 ..... N77-33300 #
AD-A041111 ..... N77-34021 #
AD-A041130 ..... N77-33971 #
AD-A041144 ..... N77-33419 #
AD-A041151 ..... N77-33124 #
AD-A041156 ..... N77-33153 #
AD-A041163 ..... N77-33523 #
AD-A041178 ..... N77-33878 #
AD-A041191 ..... N77-33134 #
AD-A041192 ..... N77-33524 #
AD-A041203 ..... N77-33413 #
AD-A041205 ..... N77-33522 #
AD-A041207 ..... N77-33353 #
AD-A041208 ..... N77-33152 #
AD-A041214 ..... N77-33270 #
AD-A041216 ..... N77-33501 #
AD-A041218 ..... N77-33320 #
AD-A041222 ..... N77-33217 #
AD-A041227 ..... N77-33445 #
AD-A041232 ..... N77-33530 #
AD-A041239 ..... N77-33723 #
AD-A041257 ..... N77-33171 #
AD-A041259 ..... N77-33359 #
AD-A041283 ..... N77-33267 #
AD-A041284 ..... N77-33271 #
AD-A041320 ..... N77-33485 #
AD-A041329 ..... N77-33418 #
AD-A041332 ..... N77-33858 #
AD-A041339 ..... N77-33538 #
AD-A041340 ..... N77-33299 #
AD-A041351 ..... N77-33173 #
AD-A041372 ..... N77-33892 #
AD-A041380 ..... N77-33539 #
AD-A041384 ..... N77-33435 #
AD-A041411 ..... N77-33436 #
AD-A041413 ..... N77-33269 #
AD-A041420 ..... N77-33355 #
AD-A041421 ..... N77-33319 #
AD-A041436 ..... N77-33897 #
AD-A041439 ..... N77-33298 #
AD-A041443 ..... N77-33412 #
AD-A041447 ..... N77-33241 #
AD-A041448 ..... N77-33744 #
AD-A041449 ..... N77-33746 #
AD-A041453 ..... N77-33745 #
AD-A041457 ..... N77-33393 #
AD-A041486 ..... N77-33500 #
AD-A041490 ..... N77-33268 #
AD-A041492 ..... N77-33170 #
AD-A041494 ..... N77-33358 #
AD-A041506 ..... N77-33521 #
AD-A041507 ..... N77-33360 #
AD-A041510 ..... N77-34020 #
AD-A041511 ..... N77-33357 #
AD-A041517 ..... N77-33414 #
AD-A041530 ..... N77-33174 #
AD-A041532 ..... N77-33321 #
AD-A041536 ..... N77-33354 #
AD-A041537 ..... N77-33486 #
AD-A041545 ..... N77-34006 #
AD-A041547 ..... N77-33477 #
AD-A041564 ..... N77-33417 #
AD-A041566 ..... N77-33515 #
AD-A041570 ..... N77-33158 #
AD-A041572 ..... N77-33416 #
AD-A041590 ..... N77-33415 #
AD-A041599 ..... N77-33727 #
AD-A041629 ..... N77-33932 #
AD-A041630 ..... N77-33871 #
AD-A041632 ..... N77-33882 #
AD-A041634 ..... N77-33504 #
AD-A041649 ..... N77-33859 #
AD-A041652 ..... N77-33881 #
AD-A041662 ..... N77-33750 #
AD-A041665 ..... N77-33365 #
AD-A041667 ..... N77-33913 #
AD-A041669 ..... N77-33879 #
AD-A041671 ..... N77-33373 #
AD-A041676 ..... N77-33900 #
AD-A041678 ..... N77-33885 #
AD-A041689 ..... N77-33503 #

AD-A041711 ..... N77-33138 #
AD-A041712 ..... N77-33396 #
AD-A041713 ..... N77-33397 #
AD-A041717 ..... N77-33525 #
AD-A041724 ..... N77-33324 #
AD-A041727 ..... N77-33880 #
AD-A041729 ..... N77-33914 #
AD-A041730 ..... N77-33176 #
AD-A041736 ..... N77-33371 #
AD-A041737 ..... N77-34007 #
AD-A041738 ..... N77-33421 #
AD-A041740 ..... N77-33219 #
AD-A041741 ..... N77-33451 #
AD-A041744 ..... N77-33917 #
AD-A041746 ..... N77-33933 #
AD-A041747 ..... N77-33883 #
AD-A041748 ..... N77-33916 #
AD-A041751 ..... N77-33448 #
AD-A041753 ..... N77-34025 #
AD-A041754 ..... N77-34022 #
AD-A041756 ..... N77-34045 #
AD-A041758 ..... N77-34030 #
AD-A041765 ..... N77-33423 #
AD-A041775 ..... N77-33972 #
AD-A041777 ..... N77-33363 #
AD-A041779 ..... N77-33502 #
AD-A041780 ..... N77-33178 #
AD-A041781 ..... N77-33686 #
AD-A041782 ..... N77-33179 #
AD-A041794 ..... N77-33899 #
AD-A041799 ..... N77-33732 #
AD-A041812 ..... N77-33934 #
AD-A041813 ..... N77-33206 #
AD-A041814 ..... N77-33915 #
AD-A041819 ..... N77-33177 #
AD-A041822 ..... N77-34024 #
AD-A041831 ..... N77-33542 #
AD-A041849 ..... N77-33175 #
AD-A041854 ..... N77-33449 #
AD-A041857 ..... N77-33526 #
AD-A041860 ..... N77-33615 #
AD-A041879 ..... N77-33752 #
AD-A041880 ..... N77-33751 #
AD-A041883 ..... N77-33942 #
AD-A041891 ..... N77-33135 #
AD-A041902 ..... N77-33364 #
AD-A041904 ..... N77-33729 #
AD-A041908 ..... N77-33902 #
AD-A041909 ..... N77-33898 #
AD-A041910 ..... N77-33244 #
AD-A041912 ..... N77-33243 #
AD-A041917 ..... N77-33537 #
AD-A041918 ..... N77-34019 #
AD-A041944 ..... N77-33386 #
AD-A041946 ..... N77-33450 #
AD-A041947 ..... N77-34023 #
AD-A041953 ..... N77-34028 #
AD-A041959 ..... N77-33366 #
AD-A041960 ..... N77-34008 #
AD-A041969 ..... N77-33943 #
AD-A041971 ..... N77-33136 #
AD-A041975 ..... N77-33137 #
AD-A041980 ..... N77-33372 #
AD-A041982 ..... N77-33893 #
AD-A041985 ..... N77-33912 #
AD-A042005 ..... N77-33205 #
AD-A042006 ..... N77-33860 #
AD-A042024 ..... N77-33447 #
AD-A042031 ..... N77-33961 #
AD-A042039 ..... N77-33301 #
AD-A042042 ..... N77-33422 #
AD-A042043 ..... N77-33272 #
AD-A042044 ..... N77-33361 #
AD-A042045 ..... N77-33362 #
AD-A042057 ..... N77-33731 #
AD-A042059 ..... N77-33748 #
AD-A042063 ..... N77-33155 #
AD-A042070 ..... N77-33970 #
AD-A042072 ..... N77-33123 #
AD-A042076 ..... N77-33685 #
AD-A042082 ..... N77-33420 #
AD-A042084 ..... N77-33132 #
AD-A042092 ..... N77-33499 #
AD-A042093 ..... N77-33390 #
AD-A042094 ..... N77-33394 #
AD-A042102 ..... N77-33122 #
AD-A042103 ..... N77-33749 #
AD-A042104 ..... N77-33204 #
AD-A042106 ..... N77-33322 #

AD-A042108 ..... N77-33323 #
AD-A042111 ..... N77-33730 #
AD-A042112 ..... N77-33154 #
AD-A042114 ..... N77-33156 #
AD-A042117 ..... N77-33930 #
AD-A042122 ..... N77-33302 #
AD-A042123 ..... N77-33944 #
AD-A042124 ..... N77-33901 #
AD-A042126 ..... N77-33884 #
AD-A042130 ..... N77-33487 #
AD-A042132 ..... N77-33395 #
AD-A042134 ..... N77-33101 #
AD-A042136 ..... N77-33931 #
AD-A042137 ..... N77-33938 #
AD-A042147 ..... N77-33974 #
AD-A042159 ..... N77-33919 #
AD-A042188 ..... N77-33326 #
AD-A042201 ..... N77-33850 #
AD-A042272 ..... N77-33617 #
AD-A042304 ..... N77-34032 #
AD-A042317 ..... N77-33778 #
AD-A042323 ..... N77-33325 #
AD-A042341 ..... N77-33505 #
AD-A042348 ..... N77-33452 #
AD-A042349 ..... N77-33506 #
AD-A042361 ..... N77-33543 #
AD-A042375 ..... N77-33688 #
AD-A042376 ..... N77-33967 #
AD-A042391 ..... N77-33507 #
AD-A042419 ..... N77-33139 #
AD-A042429 ..... N77-33975 #
AD-A042444 ..... N77-33303 #
AD-A042449 ..... N77-33368 #
AD-A042451 ..... N77-33921 #
AD-A042462 ..... N77-33207 #
AD-A042497 ..... N77-33488 #
AD-A042504 ..... N77-33508 #
AD-A042515 ..... N77-33399 #
AD-A042545 ..... N77-33527 #
AD-A042565 ..... N77-33733 #
AD-A042579 ..... N77-33398 #
AD-A042597 ..... N77-33918 #
AD-A042599 ..... N77-33528 #
AD-A042638 ..... N77-33886 #
AD-A042640 ..... N77-33263 #
AD-A042644 ..... N77-33920 #
AD-A042646 ..... N77-33872 #
AD-A042653 ..... N77-33369 #
AD-A042657 ..... N77-33424 #
AD-A042659 ..... N77-33757 #
AD-A042661 ..... N77-33935 #
AD-A042666 ..... N77-33425 #
AD-A042667 ..... N77-33544 #
AD-A042669 ..... N77-33545 #
AD-A042681 ..... N77-33937 #
AD-A042683 ..... N77-33936 #
AD-A042690 ..... N77-33939 #
AD-A042694 ..... N77-33922 #
AD-A042715 ..... N77-33304 #
AD-A042720 ..... N77-33946 #
AD-A042723 ..... N77-33945 #
AD-A042737 ..... N77-34046 #
AD-A042739 ..... N77-33940 #
AD-A042775 ..... N77-34033 #
AD-A042782 ..... N77-33903 #
AD-A042807 ..... N77-33923 #
AD-A042811 ..... N77-33454 #
AD-A042873 ..... N77-33546 #
AD-A042876 ..... N77-34034 #
AD-A042916 ..... N77-33924 #
AD-A042959 ..... N77-34053 #
AD-A042985 ..... N77-33509 #

AEDC-TR-77-52 ..... N77-33219 #

AERO-1241 ..... N77-33205 #

AEROTHERM-FR-77-247 ..... N77-33372 #

AFAL-TR-75-31 ..... N77-33884 #
AFAL-TR-76-200 ..... N77-33884 #
AFAL-TR-76-230 ..... N77-33509 #
AFAL-TR-76-270 ..... N77-33486 #
AFAL-TR-77-8-VOL-1 ..... N77-33138 #

AFAPL-TR-75-59-VOL-2 ..... N77-33302 #
AFAPL-TR-75-59-VOL-3 ..... N77-33173 #
AFAPL-TR-76-68-VOL-4 ..... N77-33177 #
AFAPL-TR-76-100 ..... N77-33612 #

AFAPL-TR-76-110 ..... N77-33613 #
AFAPL-TR-77-1-VOL-2 ..... N77-33174 #

AFCEC-TR-77-11 ..... N77-33614 #

AFFDL-TR-76-139 ..... N77-33123 #
AFFDL-TR-76-14123 ..... N77-33354 #
AFFDL-TR-77-10 ..... N77-33447 #

AFGL-TR-76-0255 ..... N77-34086 #
AFGL-TR-76-0267 ..... N77-34088 #
AFGL-TR-76-0295 ..... N77-34087 #
AFGL-TR-77-0031 ..... N77-33244 #
AFGL-TR-77-0106 ..... N77-33729 #

AFHRL-TR-76-65 ..... N77-33216 #
AFHRL-TR-77-3223 ..... N77-33860 #

AFIT-DS/EE/77-1 ..... N77-33899 #

AFIT-TR-77-3 ..... N77-33545 #

AFIT/DS/PH/76-4 ..... N77-33486 #

AFML-TR-74-189-PT-3 ..... N77-33522 #
AFML-TR-76-196 ..... N77-33270 #
AFML-TR-76-198 ..... N77-33355 #
AFML-TR-76-200 ..... N77-33319 #
AFML-TR-76-208 ..... N77-33178 #
AFML-TR-76-218 ..... N77-33170 #
AFML-TR-76-244-PT-1 ..... N77-33268 #
AFML-TR-77-75 ..... N77-33326 #

AFOSR-77-0121TR ..... N77-33317 #
AFOSR-77-0362TR ..... N77-33849 #
AFOSR-77-0518TR ..... N77-33848 #
AFOSR-77-0706TR ..... N77-33267 #
AFOSR-77-0712TR ..... N77-33912 #
AFOSR-77-0721TR ..... N77-33363 #
AFOSR-77-0722TR ..... N77-33901 #
AFOSR-77-0728TR ..... N77-33206 #
AFOSR-77-0729TR ..... N77-33934 #
AFOSR-77-0745TR ..... N77-33915 #
AFOSR-77-0765TR ..... N77-33321 #
AFOSR-77-0777TR ..... N77-33397 #
AFOSR-77-0778TR ..... N77-33500 #
AFOSR-77-0793TR ..... N77-33448 #
AFOSR-77-0799TR ..... N77-33914 #
AFOSR-77-0800TR ..... N77-33883 #
AFOSR-77-0801TR ..... N77-33919 #
AFOSR-77-0802TR ..... N77-33916 #
AFOSR-77-0803TR ..... N77-33931 #
AFOSR-77-0805TR ..... N77-33944 #
AFOSR-77-0856TR ..... N77-33920 #
AFOSR-77-0861TR ..... N77-33903 #
AFOSR-77-0904TR ..... N77-33924 #

AFWL-TR-75-66-ADD-2 ..... N77-33171 #
AFWL-TR-76-199 ..... N77-33386 #
AFWL-TR-77-39 ..... N77-34025 #

AGARD-AG-223 ..... N77-33220 #
AGARD-AG-229 ..... N77-34041 #

AGARD-AR-106 ..... N77-33478 #

AGARD-CP-215 ..... N77-33181 #
AGARD-CP-228 ..... N77-33208 #

AGARDOGRAPH-223 ..... N77-33220 #

AI-ERDA-13193 ..... N77-33637 #

AIAA-PAPER-77-1277 ..... N77-33163*#

AIRESEARCH-21-2498 ..... N77-33168*#
AIRESEARCH-74-9903-VOL-1 ..... N77-33263 #

AMRRC-TR-77-12 ..... N77-33318 #

AMRL-TR-76-24 ..... N77-33900 #
AMRL-TR-76-115 ..... N77-33685 #
AMRL-TR-76-120 ..... N77-33850 #
AMRL-TR-77-43 ..... N77-33859 #

ANL-CT-77-9 ..... N77-33548 #

ANL-ES-55 ..... N77-33649 #

ANL-K-76-3364-1 ..... N77-33631 #
ANL-K-76-3543-1 ..... N77-33635 #

ANL-TRANS-1083 ..... N77-33459 #

ANL-76-119 ..... N77-33633 #

AOD-TR-77-001 ..... N77-33527 #

AR-3 ..... N77-34072*#
AR-4 ..... N77-34071*#
AR-000-562 ..... N77-33718 #

ARA-176 ..... N77-33132 #

ARC-CP-1363 ..... N77-33172 #

ARC-R/M-3794 ..... N77-33453 #

ARCSL-TR-77018 ..... N77-33352 #

ARI-RR-105 ..... N77-33502 #

ARLCD-TR-77039-PT-2 ..... N77-33304 #

ARO-OMD-TR-76-78 ..... N77-33501 #

ARO-PWT-TR-77-24 ..... N77-33219 #

ARO-WKF-TR-77-38 ..... N77-33227 #

ARO-10932.2-C ..... N77-33298 #
ARO-11286.2-MG ..... N77-33323 #
ARO-11845.2-MS ..... N77-34023 #
ARO-12062.2-MS ..... N77-33322 #
ARO-12590.4-D ..... N77-33730 #
ARO-13148.1-MS23 ..... N77-33323 #
ARO-13542.1-GSX ..... N77-33300 #

AS-PAPER-264 ..... N77-33973 #
AS-PAPER-266 ..... N77-33756 #

ASD-TR-77-4 ..... N77-33156 #
ASD-TR-77-11 ..... N77-33358 #

ASE-4173 ..... N77-33969*#

ASRL-TR-184-3 ..... N77-33667 #

BARC-800-PT-4 ..... N77-33307 #

BBN-3291 ..... N77-33685 #
BBN-3295 ..... N77-33686 #
BBN-3607 ..... N77-33880 #

BC-SDAL-77-3 ..... N77-33243 #

BCL-OA-TFR-77-1 ..... N77-33683*#

BCPD-L2-8 ..... N77-33569*#

BCS-G0792 ..... N77-33891 #
BCS-G0802 ..... N77-33866 #

BERC/RI-76/12 ..... N77-33375 #
BERC/RI-76/17-VOL-1 ..... N77-33377 #
BERC/RI-76/17-VOL-2 ..... N77-33378 #

BLL-BLRDR-5299-(2113.56F) ..... N77-34043 #
BLL-BLRDR-5369-(2113.56F) ..... N77-34042 #

BMA-24 ..... N77-33761 #

BMFT-FB-W-76-14 ..... N77-34089 #
BMFT-FB-W-76-20 ..... N77-33245 #
BMFT-FB-W-76-23 ..... N77-33739 #

BNL-NUREG-50596 ..... N77-33328 #

BNL-20916 ..... N77-34054 #
BNL-22202 ..... N77-33426 #
BNL-22311 ..... N77-33638 #
BNL-22440 ..... N77-33690 #
BNL-22445 ..... N77-34038 #

BNWL-1939-6 ..... N77-34013 #
BNWL-2168 ..... N77-33653 #

BRL-IMR-474 ..... N77-33544 #

BRL-MR-2757 ..... N77-33449 #
BRL-MR-2758 ..... N77-34028 #
BRL-MR-2761 ..... N77-33544 #

BR51061 ..... N77-33532 #
BR55362 ..... N77-33533
BR58399 ..... N77-33534

CA-DOT-TL-2857-1-76-45 ..... N77-33496 #
CA-DOT-TL-5149-1-76-55 ..... N77-33549 #

CALSPAN-AG-5580-E-1 ..... N77-33135 #

CALSPAN-AK-5970-F-1-VOL-1 ..... N77-33217 #

CCN/TR12 ..... N77-33871 #

CED-77-50 ..... N77-33594 #

CERL-IR-E-11 ..... N77-33398 #
CERL-IR-E-112 ..... N77-33975 #

CERL-SR-M-218 ..... N77-33539 #

CERL-TR-M-213 ..... N77-33546 #
CERL-TR-M-217 ..... N77-33538 #

CFSTN-77-1 ..... N77-33448 #

CHLD-77-14 ..... N77-33451 #

CN/TR10 ..... N77-33881 #

CNRS-CPT-76-P-849 ..... N77-34029 #

CONF-760804-7 ..... N77-33331 #
CONF-760837-P2 ..... N77-33628 #
CONF-761057-4 ..... N77-33333 #
CONF-761159-1 ..... N77-33894 #
CONF-770505-79 ..... N77-33630 #
CONF-770505-254 ..... N77-33681 #
CONF-770505-265 ..... N77-33676 #
CONF-770505-269 ..... N77-33678 #
CONF-770505-272 ..... N77-33677 #
CONF-770505-339 ..... N77-33680 #

CONS/NSF/42-1 ..... N77-33636 #
CONS/2050-1-VOL-3-APP ..... N77-33430 #
CONS/2114-3 ..... N77-33634 #

COO-2305-4 ..... N77-34026 #
COO-2581-3 ..... N77-33625 #
COO-2864-1 ..... N77-33626 #
COO-2917-76-2 ..... N77-33627 #
COO-2983-2 ..... N77-33645 #
COO-2988-1 ..... N77-33692 #

CSC/TM-75/6145 ..... N77-33591*#
CSC/TM-75/6160 ..... N77-33237*#

CSE-NOTE-42 ..... N77-33757 #

CSU-ATSP-265 ..... N77-33740 #

C76-597/201 ..... N77-33349*#

DC-TN-1225-1 ..... N77-33386 #

DHEW/PUB/FDA-77/8011 ..... N77-33853 #
DHEW/PUB/NIOSH-76/197 ..... N77-33367 #

DLR-FB-77-05 ..... N77-33401 #
DLR-FB-77-08 ..... N77-33142 #

DLR-IB-552-73/4 ..... N77-33246 #
DLR-IB-552-75/18 ..... N77-33141 #
DLR-IB-553-75/5 ..... N77-33697 #
DLR-IB-553-75/6 ..... N77-33698 #
DLR-IB-553-76/3 ..... N77-33861 #
DLR-IB-553-76/4 ..... N77-33513 #
DLR-IB-553-76/5 ..... N77-33862 #
DLR-IB-553-76/6 ..... N77-33492 #

DMS-DR-2361-VOL-1 ..... N77-33253*#
DMS-DR-2361-VOL-2 ..... N77-33254*#

DSA-4152T ..... N77-34008 #

DOC-77SDS4220 ..... N77-33251*#
DOC-77SDS4246 ..... N77-33585*#
DOC-77SDS4250 ..... N77-33250*#

DOT-HS-802-422 ..... N77-33891 #
DOT-HS-802-423 ..... N77-33866 #
DOT-HS-802341-VOL-2 ..... N77-33382 #

DOT-TSC-OST-76-30 ..... N77-33672 #

DOT-802340-VOL-1 ..... N77-33381 #

DR-76-10 ..... N77-34045 #
DR-936 ..... N77-33745 #
DR-938 ..... N77-33744 #
DR-939 ..... N77-33746 #

DRDAI-C-77-1 ..... N77-33242 #

DRDAI-TR-77-3 ..... N77-33506 #

DRDAI-T6-77-18 ..... N77-33488 #

DREP-TM-77-2 ..... N77-33487 #

DRIC-BR-556165 ..... N77-33176 #

DRSAR/SA/E-23 ..... N77-33504 #

DSE/1005-1 ..... N77-33624 #
DSE/1005-7 ..... N77-33623 #

DSL-TR-135 ..... N77-33945 #

DTNSRDC-77-0048 ..... N77-33205 #
DTNSRDC-77-0082 ..... N77-33923 #

D6-44051 ..... N77-33136 #
D6-45159 ..... N77-33147*#
D180-20746-1 ..... N77-33483*#
D210-11146-2 ..... N77-33101 #

E-27-623 ..... N77-33358 #
E-27-640 ..... N77-33359 #
E-5241 ..... N77-33351*#
E-8825 ..... N77-33517*#
E-9091-1 ..... N77-33160*#
E-9101 ..... N77-33520*#
E-9102 ..... N77-33348*#
E-9104 ..... N77-33258*#
E-9121 ..... N77-33350*#
E-9170 ..... N77-33169*#
E-9176 ..... N77-33313*#
E-9234 ..... N77-33444*#
E-9239 ..... N77-33265*#
E-9245 ..... N77-33316*#
E-9254 ..... N77-33166*#
E-9255 ..... N77-33297*#
E-9285 ..... N77-33164*#
E-9298-2 ..... N77-33518*#
E-9319 ..... N77-33162*#
E-9320 ..... N77-33163*#
E-9328 ..... N77-33161*#
E-9338 ..... N77-33720*#
E-9345 ..... N77-33999*#
E-9357 ..... N77-33929*#
E-9361 ..... N77-34000*#
E-9365 ..... N77-33232*#

ECOM-DR-77-3 ..... N77-33726 #

ECOM-74-0109-11 ..... N77-33611 #
ECOM-75-1327-2 ..... N77-33436 #
ECOM-75-1343-F ..... N77-33425 #
ECOM-76-1301-3 ..... N77-33419 #
ECOM-76-1352-I ..... N77-33420 #
ECOM-4483 ..... N77-33241 #
ECOM-5813 ..... N77-33724 #
ECOM-5818 ..... N77-33725 #
ECOM-5819 ..... N77-33732 #
ECOM-5820 ..... N77-33503 #

ED-TR-77019 ..... N77-33352 #

EDFB-IBP-76-8 ..... N77-33592 #

EIMAC-QPR-76-3 ..... N77-33414 #

EL-CR-77.013 ..... N77-33615 #

ELAB-STF44-A75044 ..... N77-33962 #
ELAB-STF44-A75080 ..... N77-33696 #

EMD-77-31 ..... N77-33671 #

EP-7357 ..... N77-33485 #

EPA-450/3-76-001 ..... N77-33700 #
EPA-530/SW-611 ..... N77-34051 #
EPA-550/9-77-350 ..... N77-33704 #
EPA-600/2-77-026-VOL-2 ..... N77-33705 #
EPA-600/2-77-030 ..... N77-34055 #
EPA-600/2-77-063 ..... N77-33708 #
EPA-600/2-77-128 ..... N77-34060 #
EPA-600/3-77-023 ..... N77-33687 #
EPA-600/3-77-042 ..... N77-33707 #
EPA-600/3-77-053 ..... N77-33703 #
EPA-600/7-77-051 ..... N77-34058 #
EPA-902/4-77-006 ..... N77-33706 #
EPA-906/9-77-001A ..... N77-33701 #

EPRI-AF-233 ..... N77-33374 #

EPRI-EL-312 ..... N77-33433 #
EPRI-EL-362 ..... N77-33327 #
EPRI-EL-374 ..... N77-33432 #
EPRI-EL-393 ..... N77-33427 #

EPRI-EM-256-SY ..... N77-33622 #
EPRI-EM-384 ..... N77-33643 #

EPRI-NP-334 ..... N77-33512 #

ER-2561 ..... N77-33525 #
ER-7850-2 ..... N77-33170 #

ERDA-76-45/9 ..... N77-33384 #
ERDA-76-142 ..... N77-33642 #
ERDA-76-163/1-VOL-1 ..... N77-33658 #
ERDA-76-163/2-VOL-2 ..... N77-33659 #
ERDA-77-36 ..... N77-34009 #
ERDA-77-37 ..... N77-33651 #
ERDA-77-57 ..... N77-33648 #

ERDA/JPL-954527-77/2 ..... N77-33347*#
ERDA/NSF-00826-75/3 ..... N77-33667 #

ES-77-2460-2 ..... N77-33369 #

ESA-TT-390 ..... N77-34089 #
ESA-TT-393 ..... N77-33245 #
ESA-TT-404 ..... N77-33739 #
ESA-TT-409 ..... N77-33246 #
ESA-TT-411 ..... N77-33475 #
ESA-TT-412 ..... N77-33127 #
ESA-TT-416 ..... N77-33401 #
ESA-TT-419 ..... N77-33142 #

ESD-TR-77-134 ..... N77-33435 #

ESD-1016 ..... N77-33694 #

ESDU-77007 ..... N77-33273

ESL-4297-1 ..... N77-33507 #
ESL-4372-2 ..... N77-33972 #

ETL-0096 ..... N77-33728 #

EXXON/GRU.1BH-77-VOL-1 ..... N77-33608*#
EXXON/GRU.2BH.77-VOL-2 ..... N77-33609*#

E77-10183 ..... N77-33553*#
E77-10223 ..... N77-33554*#
E77-10224 ..... N77-33555*#
E77-10225 ..... N77-33556*#
E77-10226 ..... N77-33557*#
E77-10227 ..... N77-33558*#
E77-10228 ..... N77-33559*#
E77-10229 ..... N77-33560*#
E77-10230 ..... N77-33561*#
E77-10231 ..... N77-33562*#
E77-10232 ..... N77-33563*#
E77-10233 ..... N77-33564*#
E77-10234 ..... N77-33565*#
E77-10235 ..... N77-33566*#
E77-10236 ..... N77-33567*#
E77-10237 ..... N77-33568*#
E77-10238 ..... N77-33569*#
E77-10239 ..... N77-33570*#
E77-10240 ..... N77-33571*#
E77-10241 ..... N77-33572*#
E77-10242 ..... N77-33573*#
E77-10243 ..... N77-33574*#
E77-10244 ..... N77-33575*#
E77-10245 ..... N77-33576*#

F-C4362 ..... N77-33626 #

FAA-AEM-77-6 ..... N77-33137 #

FAA-RD-75-162-3 ..... N77-33179 #
FAA-RD-75-173-6 ..... N77-33136 #
FAA-RD-76-79-4 ..... N77-33175 #
FAA-RD-77-66 ..... N77-33135 #

FAA-76-22-6 ..... N77-33136 #

FDA/BRH-77/98 ..... N77-33853 #

FE-2469-3 ..... N77-33650 #

FEA/B-77/135 ..... N77-33664 #
FEA/B-77/166 ..... N77-33675 #

FHWA/CA/TL-5149-76-55 ..... N77-33549 #
FHWA/PL-77/016 ..... N77-34057 #

FJSRL-TR-77-0010 ..... N77-33897 #

FR-76-102-3 ..... N77-33584*#
FR-8971 ..... N77-33315*#

FSU-STATISTICS-M383 ..... N77-33937 #
FSU-STATISTICS-M415 ..... N77-33935 #
FSU-STATISTICS-M416 ..... N77-33936 #

FZM-6661 ..... N77-33267 #

GPO-88-556 ..... N77-33599 #

HDL-086-1 ..... N77-33896 #

HEDL-THE-76-70 ..... N77-33332 #

HEL-TM-13-77 ..... N77-33858 #
HEL-TM-16-77 ..... N77-33856 #

HONEYWELL-76SRC/16 ..... N77-33202*#
HONEYWELL-76SRC/16 ..... N77-33203*#

HPP-77-5 ..... N77-33946 #

HUD/RES-1094 ..... N77-34056 #

H352-02 ..... N77-33380*#

I/EM-76/0017 ..... N77-34039 #

IAEA-CN-36/175 ..... N77-33681 #
IAEA-CN-36/396 ..... N77-33677 #
IAEA-CN-36/398 ..... N77-33678 #
IAEA-CN-36/399 ..... N77-33676 #
IAEA-CN-36/507 ..... N77-33630 #
IAEA-CN-36/538 ..... N77-33679 #
IAEA-CN-36/583 ..... N77-33680 #

IIEQ-77-17 ..... N77-33709 #

ILR-18 ..... N77-33468 #

INEL-TR-10 ..... N77-33460 #

IPPJ-J-27 ..... N77-33998 #

IPPJ-260 ..... N77-33978 #
IPPJ-262 ..... N77-33979 #
IPPJ-263 ..... N77-33980 #
IPPJ-264 ..... N77-33981 #
IPPJ-265 ..... N77-33982 #
IPPJ-266 ..... N77-33983 #
IPPJ-267 ..... N77-33984 #
IPPJ-268 ..... N77-33985 #

IPPJ-269 ..... N77-33986 #
IPPJ-270 ..... N77-33987 #
IPPJ-271 ..... N77-34016 #
IPPJ-272 ..... N77-33988 #
IPPJ-273 ..... N77-33910 #
IPPJ-274 ..... N77-33989 #
IPPJ-275 ..... N77-33990 #
IPPJ-276 ..... N77-33991 #
IPPJ-277 ..... N77-33992 #
IPPJ-278 ..... N77-33993 #
IPPJ-279 ..... N77-33994 #
IPPJ-280 ..... N77-33995 #
IPPJ-281 ..... N77-33996 #
IPPJ-282 ..... N77-33997 #
IPPJ-293 ..... N77-34001 #
IPPJ-294 ..... N77-34002 #
IPPJ-295 ..... N77-34003 #
IPPJ-296 ..... N77-34004 #
IPPJ-297 ..... N77-34005 #

IR-1 ..... N77-33650 #
IR-2 ..... N77-33397 #

ISBN-0-85350-141-6 ..... N77-34043 #
ISBN-0-85679-177-6 ..... N77-33273
ISBN-2-7170-0420-3 ..... N77-33470 #
ISBN-2-7170-0424-6 ..... N77-33473 #
ISBN-2-7170-0434-3 ..... N77-33471 #
ISBN-2-7170-0435-I ..... N77-33474 #
ISBN-2-7170-0436-X ..... N77-33126 #
ISBN-2-7170-0437-8 ..... N77-33180 #
ISBN-2-7170-0438-6 ..... N77-33472 #
ISBN-2-7170-0439-4 ..... N77-33125 #
ISBN-3-427-7584-19 ..... N77-33761 #
ISBN-3-7696-9284-5 ..... N77-33228 #
ISBN-3-7983-0571-4 ..... N77-33468 #
ISBN-82-595-696-3 ..... N77-33696 #
ISBN-82-595-0427-8 ..... N77-33461 #
ISBN-82-595-0428-6 ..... N77-33462 #
ISBE-82-595-0434-0 ..... N77-33463 #
ISBN-82-595-0624-6 ..... N77-33962 #
ISBN-82-595-0654-8 ..... N77-33464 #
ISBN-82-595-0663-7 ..... N77-33465 #
ISBN-82-595-0833-8 ..... N77-33466 #
ISBN-82-595-0834-6 ..... N77-33467 #
ISBN-92-835-0198-5 ..... N77-33181 #
ISBN-92-835-0200-00 ..... N77-33208 #
ISBN-92-835-1245-6 ..... N77-33220 #

ISI/RR-77-59 ..... N77-33879 #

ISL-CO-201/76 ..... N77-33494 #
ISL-CO-214/76 ..... N77-33495 #

ISL-R-108/76 ..... N77-33308 #
ISL-R-115/76 ..... N77-33490 #
ISL-R-123/76 ..... N77-33491 #
ISL-R-132/76 ..... N77-33493 #
ISL-R-134/76 ..... N77-33469 #
ISL-R-137/76 ..... N77-33514 #

ISSN-0439-3465 ..... N77-33403 #

JPL-PUB-77-23 ..... N77-33875*
JPL-PUB-77-27-REV-1 ..... N77-33604*#
JPL-PUB-77-28 ..... N77-33235*#
JPL-PUB-77-39 ..... N77-33867*#
JPL-PUB-77-40 ..... N77-33519*#
JPL-PUB-77-46 ..... N77-33911*#
JPL-PUB-77-51-VOL-1 ..... N77-34074*#
JPL-PUB-77-51-VOL-2 ..... N77-34075*#
JPL-PUB-77-51-VOL-3 ..... N77-34076*#
JPL-PUB-77-51-VOL-4 ..... N77-34077*#
JPL-PUB-77-51-VOL-5 ..... N77-34078*#
JPL-PUB-77-51-VOL-6 ..... N77-34079*#
JPL-PUB-77-51-VOL-7 ..... N77-34080*#
JPL-PUB-77-51-VOL-8 ..... N77-34081*#
JPL-PUB-77-51-VOL-9 ..... N77-34082*#

JPL-SP-43-39 ..... N77-33233*#

JPL-TH-33-783-VOL-3 ..... N77-33229*#

JPRS-69899 ..... N77-33841 #
JPRS-69924 ..... N77-33842 #
JPRS-69964 ..... N77-33843 #
JPRS-70017 ..... N77-33844 #

JSC-07636-REV-A ..... N77-33252*#

JSC-11625 ..... N77-34050*#
JSC-12973-VOL-2 ..... N77-33600*#
JSC-13049 ..... N77-33247*#

K/CSD-5 ..... N77-33455 #

KU-FRL-317-3 ..... N77-33957*#
KU-FRL-317-4 ..... N77-33958*#
KU-FRL-317-5 ..... N77-33959*#

L-10868 ..... N77-33442*#
L-10871 ..... N77-33116*#
L-11064 ..... N77-33115*#
L-11227 ..... N77-33111*#
L-11269 ..... N77-33157*#
L-11288 ..... N77-33259*#
L-11292 ..... N77-33150*#
L-11600 ..... N77-33236*#
L-11679 ..... N77-33112*#
L-11771 ..... N77-33876*#

LA-UR-77-532 ..... N77-33851 #
LA-UR-77-664 ..... N77-33530 #

LA-6569-MS ..... N77-33646 #
LA-6695-MS ..... N77-33734 #
LA-6696-MS ..... N77-33735 #
LA-6738-PR ..... N77-33693 #
LA-6747-MS ..... N77-33976 #

LBL-5103 ..... N77-33331 #
LBL-5582 ..... N77-33457 #
LBL-5594 ..... N77-33894 #
LBL-5706 ..... N77-33329 #
LBL-5763 ..... N77-33330 #
LBL-5927 ..... N77-33655 #
LBL-5928 ..... N77-33640 #
LBL-5996 ..... N77-33647 #
LBL-6094 ..... N77-33305 #

LC-76-54287 ..... N77-33780*#
LC-77-60016 ..... N77-34040 #

LEC-5778 ..... N77-33582*#
LEC-5789 ..... N77-33581*#
LEC-6107 ..... N77-33481*#

LG77ER0042 ..... N77-33540 #

LR-28051 ..... N77-33271 #

MA-657T ..... N77-33553*#

MANCP-370(77) ..... N77-33373 #

MBB-URV-84 ..... N77-33245 #

MCR-77-105 ..... N77-33248*#

MDC-G6922-PT-3-VOL-4 ..... N77-33238*#
MDC-G6922-PT-3-VOL-5 ..... N77-33239*#

MDC-J4555 ..... N77-33149*#
MDC-J7601 ..... N77-33114*#

MERADCOM-2210 ..... N77-33877 #

MERC/CR-77/4-VOL-1 ..... N77-33660 #
MERC/CR-77/4-VOL-2 ..... N77-33661 #

MIMEO-SER-494 ..... N77-33933 #
MIMEO-SER-495 ..... N77-33917 #
MIMEO-SER-1123 ..... N77-33912 #

MIT-LCS-TM-86 ..... N77-33892 #

MRL-TR-76-23C ..... N77-33527 #
MRL-TR-77-27C ..... N77-33619 #

MRL-53 ..... N77-33363 #

MONO-SER-3 ..... N77-33750 #

MONO-24-1977 ..... N77-33403 #
MONO-1976-2 ..... N77-33689 #

MRC-R-291 ..... N77-34008 #

MRC-TSR-1740 ..... N77-33922 #

MTR-3375 ..... N77-33435 #
MTR-7367 ..... N77-33674 #

MTS-HWL-4116-776 ..... N77-33314*#

M77-19 ..... N77-33662 #

NA-77-296 ..... N77-33201*#

NADC-75207-30 ..... N77-33353 #
NADC-77076-30 ..... N77-33158 #
NADC-77183-30 ..... N77-33152 #

NAL-BIBL-SER-77 ..... N77-33131 #

NASA-CP-2015 ..... N77-33876*#
NASA-CP-2016 ..... N77-33297*#

NASA-CR-2808 ..... N77-33100*#
NASA-CR-2832 ..... N77-33104*#
NASA-CR-2867 ..... N77-33255*#
NASA-CR-2868 ..... N77-33256*#
NASA-CR-2870 ..... N77-33105*#
NASA-CR-2872 ..... N77-33440*#
NASA-CR-2875 ..... N77-33230*#
NASA-CR-2880 ..... N77-33202*#
NASA-CR-2881 ..... N77-33203*#
NASA-CR-2892 ..... N77-33960*#
NASA-CR-2887 ..... N77-33149*#
NASA-CR-2888 ..... N77-33106*#
NASA-CR-2893 ..... N77-33869*#
NASA-CR-2894 ..... N77-33260*#
NASA-CR-2898 ..... N77-33121*#
NASA-CR-2899 ..... N77-33113*#
NASA-CR-2905 ..... N77-33114*#
NASA-CR-135105 ..... N77-33314*#
NASA-CR-135206-VOL-1 ..... N77-33608*#
NASA-CR-135206-VOL-2 ..... N77-33609*#
NASA-CR-135214 ..... N77-33168*#
NASA-CR-135260 ..... N77-33437*#
NASA-CR-135261 ..... N77-33222*#
NASA-CR-135276 ..... N77-33684*#
NASA-CR-135282 ..... N77-33483*#
NASA-CR-141428 ..... N77-33577*#
NASA-CR-141430 ..... N77-33261*#
NASA-CR-143846 ..... N77-33201*#
NASA-CR-144832 ..... N77-33237*#
NASA-CR-145218 ..... N77-33580*#
NASA-CR-145229 ..... N77-33147*#
NASA-CR-145235 ..... N77-33102*#
NASA-CR-145236 ..... N77-33296*#
NASA-CR-145244 ..... N77-33535*#
NASA-CR-145246 ..... N77-33200*#
NASA-CR-145247 ..... N77-33145*#
NASA-CR-145250 ..... N77-33148*#
NASA-CR-145252 ..... N77-33585*#
NASA-CR-150045 ..... N77-33479*#
NASA-CR-150409 ..... N77-33379*#
NASA-CR-150410 ..... N77-33380*#
NASA-CR-150411 ..... N77-33516*#
NASA-CR-150412 ..... N77-33315*#
NASA-CR-150413 ..... N77-33248*#
NASA-CR-150417 ..... N77-34067*#
NASA-CR-150418 ..... N77-33589*#
NASA-CR-150419 ..... N77-33590*#
NASA-CR-150420 ..... N77-33349*#
NASA-CR-151370 ..... N77-33253*#
NASA-CR-151371 ..... N77-33254*#
NASA-CR-151451 ..... N77-33553*#
NASA-CR-151506 ..... N77-33605*#
NASA-CR-151507 ..... N77-33606*#
NASA-CR-151508 ..... N77-33388*#
NASA-CR-151513 ..... N77-34048*#
NASA-CR-151517 ..... N77-33389*#
NASA-CR-151518 ..... N77-33837*#
NASA-CR-151520 ..... N77-33239*#
NASA-CR-151521 ..... N77-33238*#
NASA-CR-151522 ..... N77-33586*#
NASA-CR-151526 ..... N77-33481*#
NASA-CR-151527 ..... N77-33582*#
NASA-CR-151528 ..... N77-33581*#
NASA-CR-151529 ..... N77-33838*#
NASA-CR-152004 ..... N77-34061*#
NASA-CR-152538 ..... N77-33224*#
NASA-CR-152539 ..... N77-33225*#
NASA-CR-152586 ..... N77-34084*#
NASA-CR-152594 ..... N77-33250*#
NASA-CR-152595 ..... N77-33742*#
NASA-CR-152596 ..... N77-33719*#
NASA-CR-152597 ..... N77-33234*#
NASA-CR-152598 ..... N77-33591*#
NASA-CR-152603 ..... N77-33257*#
NASA-CR-152604 ..... N77-34085*#
NASA-CR-152605 ..... N77-33482*#
NASA-CR-152607 ..... N77-33262*#
NASA-CR-152608 ..... N77-33409*#
NASA-CR-152609 ..... N77-33607*#
NASA-CR-152611 ..... N77-33251*#
NASA-CR-152612 ..... N77-33602*#
NASA-CR-152613 ..... N77-33603*#
NASA-CR-154983 ..... N77-33554*#
NASA-CR-155014 ..... N77-33555*#
NASA-CR-155015 ..... N77-33556*#
NASA-CR-155016 ..... N77-33557*#
NASA-CR-155017 ..... N77-33558*#
NASA-CR-155018 ..... N77-33559*#
NASA-CR-155019 ..... N77-33560*#
NASA-CR-155020 ..... N77-33561*#
NASA-CR-155021 ..... N77-33562*#
NASA-CR-155022 ..... N77-33563*#
NASA-CR-155023 ..... N77-33564*#
NASA-CR-155024 ..... N77-33565*#
NASA-CR-155025 ..... N77-33566*#
NASA-CR-155026 ..... N77-33567*#
NASA-CR-155027 ..... N77-33568*#
NASA-CR-155028 ..... N77-33569*#
NASA-CR-155029 ..... N77-33570*#
NASA-CR-155030 ..... N77-33571*#
NASA-CR-155031 ..... N77-33572*#
NASA-CR-155032 ..... N77-33573*#
NASA-CR-155033 ..... N77-33574*#
NASA-CR-155034 ..... N77-33575*#
NASA-CR-155035 ..... N77-33576*#
NASA-CR-155053 ..... N77-33438*#
NASA-CR-155054 ..... N77-34071*#
NASA-CR-155055 ..... N77-34072*#
NASA-CR-155056 ..... N77-34073*#
NASA-CR-155144 ..... N77-33717*#
NASA-CR-155147 ..... N77-33233*#
NASA-CR-155148 ..... N77-33223*#
NASA-CR-155149 ..... N77-33969*#
NASA-CR-155150 ..... N77-33683*#
NASA-CR-155152 ..... N77-33957*#
NASA-CR-155153 ..... N77-33958*#
NASA-CR-155154 ..... N77-33959*#
NASA-CR-155155 ..... N77-33601*#
NASA-CR-155156 ..... N77-33584*#
NASA-CR-155157 ..... N77-33249*#
NASA-CR-155158 ..... N77-33347*#
NASA-CR-155159 ..... N77-34070*#
NASA-CR-155160 ..... N77-34069*#
NASA-CR-155161 ..... N77-33266*#
NASA-CR-155162 ..... N77-33443*#
NASA-CR-155164 ..... N77-33867*#
NASA-CR-155165 ..... N77-33235*#
NASA-CR-155166 ..... N77-33604*#
NASA-CR-155167 ..... N77-33875*#
NASA-CR-155168 ..... N77-33229*#
NASA-CR-155169 ..... N77-33941*#
NASA-CR-155170 ..... N77-33221*#
NASA-CR-155171 ..... N77-33587*#
NASA-CR-155172 ..... N77-33387*#
NASA-CR-155176 ..... N77-34083*#
NASA-CR-155177 ..... N77-33911*#
NASA-CR-155180 ..... N77-33519*#
NASA-CR-155181 ..... N77-34081*#
NASA-CR-155181 ..... N77-34082*#
NASA-CR-155183 ..... N77-34080*#
NASA-CR-155184 ..... N77-34079*#
NASA-CR-155185 ..... N77-34078*#
NASA-CR-155186 ..... N77-34077*#
NASA-CR-155187 ..... N77-34076*#
NASA-CR-155188 ..... N77-34075*#
NASA-CR-155189 ..... N77-34074*#
NASA-CR-155190 ..... N77-33551*#
NASA-CR-155192 ..... N77-33264*#
NASA-CR-155193 ..... N77-33226*#
NASA-CR-155194 ..... N77-33721*#
NASA-CR-155195 ..... N77-33411*#
NASA-CR-155198 ..... N77-33840*#
NASA-CR-155199 ..... N77-33839*#
NASA-CR-155200 ..... N77-33847*#

NASA-SP-377 ..... N77-33780*#
NASA-SP-421 ..... N77-34063*#

NASA-TM-X-3431 ..... N77-33116*#

NASA-TM-X-3431-PT-1 ..... N77-33117*#
NASA-TM-X-3431-PT-2 ..... N77-33118*#
NASA-TM-X-3431-PT-3 ..... N77-33119*#
NASA-TM-X-3431-PT-4 ..... N77-33120*#
NASA-TM-X-3534 ..... N77-33115*#
NASA-TM-X-3555 ..... N77-33258*#
NASA-TM-X-3560 ..... N77-33236*#
NASA-TM-X-52659 ..... N77-33351*#
NASA-TM-X-58193 ..... N77-34050*#
NASA-TM-X-62144 ..... N77-33151*#
NASA-TM-X-71398 ..... N77-34068*#
NASA-TM-X-71400 ..... N77-34091*#
NASA-TM-X-71402 ..... N77-34092*#
NASA-TM-X-71404 ..... N77-33710 #
NASA-TM-X-71405 ..... N77-33588*#
NASA-TM-X-71407 ..... N77-34062*#
NASA-TM-X-72614 ..... N77-34065*#
NASA-TM-X-72615 ..... N77-34066*#
NASA-TM-X-73628 ..... N77-33159*#
NASA-TM-X-73659 ..... N77-33313*#
NASA-TM-X-73666 ..... N77-33160*#
NASA-TM-X-73673 ..... N77-33517*#
NASA-TM-X-73793 ..... N77-34000*#
NASA-TM-X-73911 ..... N77-33108*#

NASA-TM-72755 ..... N77-33103*#
NASA-TM-73263 ..... N77-33130*#
NASA-TM-73495 ..... N77-33161*#
NASA-TM-73699 ..... N77-33265*#
NASA-TM-73707 ..... N77-33316*#
NASA-TM-73728 ..... N77-33164*#
NASA-TM-73734 ..... N77-33166*#
NASA-TM-73736 ..... N77-33518*#
NASA-TM-73737 ..... N77-33536*#
NASA-TM-73741 ..... N77-33167*#
NASA-TM-73747 ..... N77-33162*#
NASA-TM-73748 ..... N77-33163*#
NASA-TM-73749 ..... N77-33232*#
NASA-TM-73776 ..... N77-33165*#
NASA-TM-73781 ..... N77-33720*#
NASA-TM-73783 ..... N77-33999*#
NASA-TM-73790 ..... N77-33929*#
NASA-TM-74059 ..... N77-33107*#
NASA-TM-74065 ..... N77-33439*#
NASA-TM-74066 ..... N77-33579*#
NASA-TM-74067 ..... N77-34018*#
NASA-TM-74072 ..... N77-33146*#
NASA-TM-74081 ..... N77-33497*#
NASA-TM-74085 ..... N77-33498*#
NASA-TM-74908 ..... N77-34049*#
NASA-TM-74942 ..... N77-33600*#
NASA-TM-74965 ..... N77-33247*#
NASA-TM-74974 ..... N77-33252*#
NASA-TM-74975 ..... N77-33240*#
NASA-TM-75141 ..... N77-33410*#
NASA-TM-75177 ..... N77-33846*#
NASA-TM-78130 ..... N77-33578*#
NASA-TM-78131 ..... N77-34044*#

NASA-TN-D-8433 ..... N77-33442*#
NASA-TN-D-8455 ..... N77-33150*#
NASA-TN-D-8523 ..... N77-33157*#

NASA-TP-1009 ..... N77-33111*#
NASA-TP-1020 ..... N77-33112*#
NASA-TP-1033 ..... N77-33348*#
NASA-TP-1053 ..... N77-33350*#
NASA-TP-1056 ..... N77-33169*#
NASA-TP-1060 ..... N77-33520*#
NASA-TP-1061 ..... N77-33444*#
NASA-TP-1067 ..... N77-33868*#
NASA-TP-1084 ..... N77-33259*#

NASA-TR-R-474 ..... N77-33110*#

NASA-TT-F-17432 ..... N77-33956*#
NASA-TT-F-17441 ..... N77-33845*#
NASA-TT-F-17443 ..... N77-33128*#
NASA-TT-F-17444 ..... N77-33129*#
NASA-TT-F-17544 ..... N77-33583*#

NAVTRAEQUIPC-IH-282 ..... N77-33499 #

NBS-BSS-104 ..... N77-33669 #

NBS-GCR-ETIP-77-37 ..... N77-34047 #

NBS-GCR-77-84 ..... N77-33476 #
NBS-GCR-77-89 ..... N77-33890 #
NBS-GCR-77-90 ..... N77-33310 #
NBS-GCR-77-91 ..... N77-33865 #
NBS-GCR-77-93 ..... N77-33854 #

NBS-TN-695 ..... N77-33952 #
NBS-TN-910-3-PT-1 ..... N77-33977 #
NBS-TN-937 ..... N77-33370 #
NBS-TN-947 ..... N77-34040 #

NBSIR-76-1184 ..... N77-33434 #
NBSIR-77-1204 ..... N77-33614 #
NBSIR-77-1236 ..... N77-33309 #
NBSIR-77-1237 ..... N77-33616 #
NBSIR-77-1259 ..... N77-33673 #

NCAR/CQ-5/1976-ASP-1-VOL-1 ..... N77-33776 #
NCAR/CQ-5/1976-ASP-2-VOL-2 ..... N77-33775 #

NCRE/N206 ..... N77-33534
NCRE/R627 ..... N77-33532 #
NCRE/R637 ..... N77-33533

NGTE-NT-1029 ..... N77-33172 #

NGTE-R-343 ..... N77-33176 #

NIOSH-76/197 ..... N77-33367 #

NIOSH/TC/P-012 ..... N77-33963 #

NMSU-PHYS-76-00003 ..... N77-33300 #

NOAA-TM-ERL-WMPO-35 ..... N77-33764 #
NOAA-TM-ERL-WMPO-37 ..... N77-33769 #

NOAA-TM-NESS-87 ..... N77-33768 #

NOAA-TM-NWS-HYDRO-33 ..... N77-33759 #

NOAA-TM-NWS-SR-89 ..... N77-33758 #
NOAA-TM-NWS-SR-90 ..... N77-33760 #

NOAA-TM-NWS-TDL-62 ..... N77-33753 #

NOAA-TM-NWS-WR-118 ..... N77-33763 #

NOAA-TR-EDS-21 ..... N77-33767 #
NOAA-TR-EDS-22 ..... N77-33766 #
NOAA-TR-EDS-23 ..... N77-33770 #

NOAA-76071404 ..... N77-33779 #
NOAA-77042603 ..... N77-33755 #
NOAA-77042902 ..... N77-33753 #
NOAA-77042907 ..... N77-33754 #
NOAA-77050906 ..... N77-33771 #
NOAA-77051110 ..... N77-33767 #
NOAA-77051118 ..... N77-33772 #
NOAA-77051122 ..... N77-33773 #
NOAA-77051123 ..... N77-33774 #
NOAA-77051124 ..... N77-33781 #
NOAA-77051805 ..... N77-34090 #
NOAA-77051812 ..... N77-33764 #
NOAA-77051907 ..... N77-33766 #
NOAA-77051908 ..... N77-33758 #
NOAA-77052002 ..... N77-33760 #
NOAA-77052401 ..... N77-33768 #
NOAA-77052501 ..... N77-33759 #
NOAA-77052703 ..... N77-33763 #
NOAA-77060202 ..... N77-33769 #
NOAA-77062711 ..... N77-33770 #

NP-21650 ..... N77-33689 #

NPS-55SU76121 ..... N77-33722 #
NPS-63RD77061 ..... N77-33748 #
NPS-67GN77061 ..... N77-33450 #

NRC-2 ..... N77-33489 #
NRC-5 ..... N77-33335 #
NRC-7 ..... N77-33547 #

NRL-GFD/OTEC-7-76-PF-3 ..... N77-33623 #
NRL-GFD/OTEC-11-75 ..... N77-33624 #

NRL-MR-3332 ..... N77-34006 #
NRL-MR-3491 ..... N77-34007 #
NRL-MR-3534 ..... N77-33421 #
NRL-MR-3548 ..... N77-33731 #

NRL-8086 ..... N77-33392 #

NR76H-135 ..... N77-33152 #

NSF/PRA-7521960/3/7 ..... N77-33674 #
NSF/RA-760569 ..... N77-33667 #
NSF/RA-760577 ..... N77-33620 #
NSF/RA-760578 ..... N77-33618 #
NSF/RA-760754 ..... N77-33385 #
NSF/RA-770063 ..... N77-33619 #
NSF/RA-770064 ..... N77-34052 #
NSF/RA-770087 ..... N77-33666 #
NSF/RA-770088 ..... N77-33665 #
NSF/RA/S-77-046 ..... N77-34031 #
NSF/RANN/GI-41891/PR/75/4 ..... N77-33652 #

NSSDC/WDC-A-R/S-77-04 ..... N77-34065*#
NSSDC/WDC-A-R/S-77-04A ..... N77-34066*#

NSWC/WOL/TR-76-145 ..... N77-33541 #

NTISUB/C/104-002 ..... N77-33133 #

NTNF-4 ..... N77-33852 #

NTSB-AAR-77-2 ..... N77-33133 #

NUC-TP-538 ..... N77-33526 #

NUREG-0179 ..... N77-33547 #
NUREG-0311 ..... N77-33335 #

NUSC-TR-5693 ..... N77-33913 #

NWSY-TR-77-1 ..... N77-33383 #

N00014-0860/2 ..... N77-33543 #

ONERA-NT-1977-1 ..... N77-33475 #
ONERA-NT-1977-2 ..... N77-33127 #

ONR-TR-109 ..... N77-33937 #
ONR-TR-115 ..... N77-33935 #
ONR-TR-116 ..... N77-33936 #

ONRL-C-4-77 ..... N77-33412 #
ONRL-C-32-76 ..... N77-33445 #

ORC-77-12 ..... N77-33942 #
ORC-77-13 ..... N77-33932 #

ORNL-CON-1 ..... N77-33641 #
ORNL-CON-8 ..... N77-33644 #

ORNL-CSD-TM-11 ..... N77-33694 #

ORNL-NIT-237 ..... N77-33458 #

ORNL-NSF-EATC-27 ..... N77-33592 #

ORNL-RUS-26 ..... N77-33695 #

ORNL-TM-5703 ..... N77-33968 #
ORNL-TM-5830 ..... N77-33691 #

OTR-77-123 ..... N77-33402 #

OU-AMNE-77-3 ..... N77-33550 #

OWRT-A-067-NC(2) ..... N77-33765 #

OWRT-B-030-OKLA(1) ..... N77-33595 #
OWRT-B-043-ARIZ(16) ..... N77-33702 #

P-1116-PT-2 ..... N77-33617 #

PANA-UVS-9 ..... N77-33684*#

PAPER-25 ..... N77-33219 #

PB-266931/5 ..... N77-33549 #
PB-266936/4 ..... N77-33381 #
PB-266937/2 ..... N77-33382 #
PB-266985/1 ..... N77-33664 #
PB-267106/3 ..... N77-33496 #
PB-267221/0 ..... N77-33434 #
PB-267278/0 ..... N77-33476 #
PB-267281/4 ..... N77-33616 #
PB-267299/6 ..... N77-34031 #
PB-267399/4 ..... N77-33367 #
PB-267443/0 ..... N77-33662 #
PB-267559/3 ..... N77-33687 #
PB-267574/2 ..... N77-33699 #
PB-267592/4 ..... N77-33756 #
PB-267593/2 ..... N77-33973 #
PB-267602/1 ..... N77-34039 #
PB-267613/8 ..... N77-33700 #
PB-267800/1 ..... N77-33621 #
PB-267832/4 ..... N77-33618 #
PB-267834/0 ..... N77-33762 #
PB-267835/7 ..... N77-33740 #
PB-267857/1 ..... N77-33663 #
PB-267937/1 ..... N77-33619 #
PB-267970/2 ..... N77-34052 #
PB-267986/8 ..... N77-33620 #
PB-268035/3 ..... N77-33753 #
PB-268041/1 ..... N77-33754 #
PB-268095/7 ..... N77-33853 #
PB-268096/5 ..... N77-33666 #
PB-268097/3 ..... N77-33665 #
PB-268162/5 ..... N77-34047 #
PB-268216/9 ..... N77-33779 #
PB-268219/3 ..... N77-33755 #
PB-268300/1 ..... N77-33550 #
PB-268479/3 ..... N77-33668 #
PB-268502/2 ..... N77-33977 #
PB-268513/9 ..... N77-34040 #
PB-268517/0 ..... N77-33890 #
PB-268526/1 ..... N77-34055 #
PB-268547/7 ..... N77-33385 #
PB-268660/8 ..... N77-34090 #
PB-268718/4 ..... N77-33667 #
PB-268740/8 ..... N77-33763 #
PB-268753/1 ..... N77-33764 #
PB-268761/4 ..... N77-33758 #
PB-268781/2 ..... N77-33674 #
PB-268792/9 ..... N77-33765 #
PB-268816/6 ..... N77-33766 #
PB-268848/9 ..... N77-33767 #
PB-268861/2 ..... N77-33708 #
PB-268871/1 ..... N77-33759 #
PB-268872/9 ..... N77-33760 #
PB-268873/7 ..... N77-33673 #
PB-268875/2 ..... N77-33874 #
PB-268883/6 ..... N77-34056 #
PB-268902/4 ..... N77-33309 #
PB-268904/0 ..... N77-33865 #
PB-268913/1 ..... N77-33776 #
PB-268914/9 ..... N77-33775 #
PB-268952/9 ..... N77-33963 #
PB-268989/1 ..... N77-33670 #
PB-269011/3 ..... N77-33702 #
PB-269034/5 ..... N77-33675 #
PB-269059/2 ..... N77-33864 #
PB-269081/6 ..... N77-33705 #
PB-269096/4 ..... N77-33593 #
PB-269128/5 ..... N77-34060 #
PB-269180/6 ..... N77-33707 #
PB-269184/8 ..... N77-33709 #
PB-269220/0 ..... N77-33952 #
PB-269223/4 ..... N77-33701 #
PB-269224/2 ..... N77-33311 #
PB-269228/3 ..... N77-33402 #
PB-269240/8 ..... N77-34059 #
PB-269257/2 ..... N77-33594 #
PB-269270/5 ..... N77-34058 #
PB-269297/8 ..... N77-33669 #
PB-269298/6 ..... N77-33704 #
PB-269299/4 ..... N77-33671 #
PB-269301/8 ..... N77-33672 #
PB-269305/9 ..... N77-33866 #
PB-269349/7 ..... N77-33703 #
PB-269353/9 ..... N77-34057 #
PB-269406/5 ..... N77-33741 #
PB-269409/9 ..... N77-33595 #
PB-269442/0 ..... N77-33774 #
PB-269480/0 ..... N77-33891 #
PB-269484/2 ..... N77-33772 #
PB-269485/9 ..... N77-33773 #
PB-269489/1 ..... N77-33310 #
PB-269619/3 ..... N77-33771 #
PB-269659/9 ..... N77-33769 #
PB-269667/2 ..... N77-33706 #
PB-269674/8 ..... N77-33768 #
PB-270222/3 ..... N77-33770 #
PB-270277/7 ..... N77-33335 #

PDA-TR-1045-00 ..... N77-33269 #

PHTC-TP-76-1 ..... N77-33857 #

POLY-EE/EP-77-031 ..... N77-33970 #

PQTR-1046-77-6 ..... N77-34030 #

PR-1 ..... N77-33774 #
PR-4 ..... N77-33619 #

PRRL-77-CR-18 ..... N77-33366 #

PRT-1042-77-2 ..... N77-34045 #

PSU-IRL-SCI-457 ..... N77-337..1*#

PTR-1033-77-3 ..... N77-33391 #

PUBL-9516 ..... N77-33599 #

PU1R2/76 ..... N77-33863 #
PU1R3/76 ..... N77-33889 #
PU1R4/74 ..... N77-33887 #
PU1R4/75 ..... N77-33888 #

P21-R-001 ..... N77-33249*#

QR-1 ..... N77-33366 #
QR-1 ..... N77-33416 #
QR-2 ..... N77-33423 #
QR-2 ..... N77-34022 #
QR-3 ..... N77-33551*#
QR-11 ..... N77-33611 #

R-75-074 ..... N77-33257*#
R-572 ..... N77-33706 #
R-768 ..... N77-33872 #
R-1889/1-AF ..... N77-33154 #
R-1979-AF ..... N77-33272 #
R-2086-ISA ..... N77-33610 #
R-2099/1-NASA-VOL-1 ..... N77-33224*#
R-2099/2-NASA-VOL-2 ..... N77-33225*#

RAD-77-100-044-16-04 ..... N77-33701 #

RADC-TR-77-31 ..... N77-33485 #
RADC-TR-77-174 ..... N77-33417 #
RADC-TR-77-176 ..... N77-33413 #
RADC-TR-77-182 ..... N77-33885 #
RADC-TR-77-197 ..... N77-33394 #
RADC-TR-77-210 ..... N77-33415 #
RADC-TR-77-214 ..... N77-33390 #

RC-6429 ..... N77-33924 #

RM-90 ..... N77-33226*#

REPT-R77AEG189 ..... N77-33175 #

REPT-4 ..... N77-33938 #
REPT-11 ..... N77-33886 #
REPT-37 ..... N77-33443*#
REPT-77-8F9-PRODE-R-1 ..... N77-34022 #
REPT-77/FFOT(S)-100 ..... N77-33134 #
REPT-471-2583-1021 ..... N77-33436 #
REPT-587-VOL-1 ..... N77-33564*#
REPT-587-VOL-2 ..... N77-33565*#
REPT-587-VOL-3 ..... N77-33566*#
REPT-699-099-022 ..... N77-33207 #
REPT-2033-76 ..... N77-33635 #
REPT-2340-I-1 ..... N77-33613 #
REPT-19202-632857 ..... N77-33496 #
REPT-19303-635149C ..... N77-33549 #
REPT-35276-02 ..... N77-33379*#
REPT-40004 ..... N77-33529 #

RH-76-7 ..... N77-33508 #

RIA-R-CR-77-019 ..... N77-33477 #

RM-648 ..... N77-33441 #

RSC-3273-7 ..... N77-33556*#
RSC-3556-1 ..... N77-33586*#

R74AEG452-VOL-4 ..... N77-33177 #
R77AEG377 ..... N77-33960*#

S-02 ..... N77-33602*#
S-2140 ..... N77-33974 #

SAI-1-120-399-A3 ..... N77-34072*#
SAI-1-120-399-S1 ..... N77-34073*#
SAI-1-120-580-A4 ..... N77-34071*#

SAM-REVIEW-1-77167930 ..... N77-33855 #

SAM-TR-5 ..... N77-33855 #

SAMSO-TR-77-31 ..... N77-33301 #
SAMSO-TR-77-47 ..... N77-33446 #
SAMSO-TR-77-98 ..... N77-33723 #
SAMSO-TR-77-107 ..... N77-33515 #
SAMSO-TR-77-132 ..... N77-33528 #
SAMSO-TR-77-12623 ..... N77-33727 #

SAN/1140-1/2-VOL-2 ..... N77-33657 #

SAND-76-0280 ..... N77-33456 #
SAND-76-0648 ..... N77-33927 #
SAND-76-0671 ..... N77-33511 #
SAND-76-0721 ..... N77-33547 #
SAND-76-0729 ..... N77-33656 #
SAND-77-0004 ..... N77-33654 #
SAND-77-0034 ..... N77-33629 #
SAND-77-8503 ..... N77-33431 #

SDC-TM-L-5839/000/00 ..... N77-33885 #

SDSU-RSI-77-08 ..... N77-33568*#

SER-C/DISS-228 ..... N77-33228 #

SER-651316 ..... N77-33143 #
SER-651317 ..... N77-33144 #

SERIAL-T-352 ..... N77-34046 #
SERIAL-T-356 ..... N77-33940 #

SGD-392-PT-1 ..... N77-34090 #

SQUID-UMO-2-PU ..... N77-33299 #

SR-11 ..... N77-33363 #

SRC-76-TR-22 ..... N77-33523 #

SRD-77-102 ..... N77-33360 #

SRI-MR-77-48 ..... N77-33730 #

SRI-RS-651 ..... N77-33522 #

SSDC-9 ..... N77-33384 #

STF71-A74038 ..... N77-33461 #
STF71-A75003 ..... N77-33462 #
STF71-A75024 ..... N77-33463 #
STF71-A75036 ..... N77-33464 #
STF71-A76005 ..... N77-33465 #
STF71-A76017 ..... N77-33466 #
STF71-A76020 ..... N77-33467 #

STI-TR-1074-1 ..... N77-33230*#

STR-508 ..... N77-33869*#

SU-ATSP-268 ..... N77-33762 #

SU-DSL-TR-137 ..... N77-33893 #

SU-SEL-77-013 ..... N77-33395 #
SU-SEL-77-017 ..... N77-33945 #
SU-SEL-77-021 ..... N77-33893 #

SU-STAN-CS-77-596 ..... N77-33946 #

SU-TR-4207-6 ..... N77-33395 #

SWRI-02-4492 ..... N77-33437*#

T-1314/5 ..... N77-33553*#

TID-27444 ..... N77-33632 #
TID-27494 ..... N77-34010 #

TIR-782-LSP-7014 ..... N77-33838*#

TPR-015 ..... N77-33605*#
TPR-028-4 ..... N77-33606*#

TR-1 ..... N77-33886 #
TR-1 ..... N77-33931 #
TR-2 ..... N77-34021 #
TR-2-77 ..... N77-33393 #
TR-6 ..... N77-33365 #
TR-7 ..... N77-33921 #
TR-13 ..... N77-33361 #
TR-14 ..... N77-33356 #
TR-14 ..... N77-33362 #
TR-18 ..... N77-33484 #
TR-19 ..... N77-33542 #
TR-22 ..... N77-34020 #
TR-29 ..... N77-33943 #
TR-39 ..... N77-34019 #
TR-40 ..... N77-33593 #
TR-40 ..... N77-33967 #
TR-76-8 ..... N77-33774 #
TR-76-092 ..... N77-34084*#
TR-77-1 ..... N77-33368 #
TR-77-002 ..... N77-33882 #
TR-184 ..... N77-33901 #
TR-229 ..... N77-33747 #
TR-504 ..... N77-33898 #
TR-539 ..... N77-33902 #
TR-0077(2260-20)-8 ..... N77-33727 #
TR-0077(2409-01)-1 ..... N77-33301 #
TR-0077(2550-15)-4 ..... N77-33446 #
TR-0077(2607)-1 ..... N77-33515 #
TR-0077(2901-03)-3 ..... N77-33528 #
TR-0077(2960-04)-3 ..... N77-33723 #
TR-79002-77-1 ..... N77-33476 #

TREE-NUREG-1011 ..... N77-33489 #

TRITA-EPP-77-02 ..... N77-34014 #
TRITA-EPP-77-08 ..... N77-33736 #
TRITA-EPP-77-11 ..... N77-33717*#
TRITA-EPP-77-12 ..... N77-33737 #
TRITA-EPP-77-13 ..... N77-33738 #

TRITA-GAD-2 ..... N77-33109 #

TRITA-PFU-77-04 ..... N77-34015 #

TSC-FAA-77-3 ..... N77-33137 #

TSI-77163 ..... N77-33742*#

TUBS/SFB58/50 ..... N77-33140 #

TUM-BITT-137 ..... N77-33228 #

U-OF-IOWA-77-13 ..... N77-34083*#
U-OF-IOWA-77-36 ..... N77-33387*#

UCID-17168 ..... N77-34012 #
UCID-17397 ..... N77-34011 #
UCID-17415 ..... N77-33926 #
UCID-17443 ..... N77-33639 #
UCID-30112-REV-1 ..... N77-33925 #
UCID-30146 ..... N77-33873 #

UCLA-ENG-7741 ..... N77-33323 #

UCRL-TRANS-11226 ..... N77-33428 #
UCRL-TRANS-11227 ..... N77-33429 #

UCRL-52228 ..... N77-33400 #

UCSD-SP-77-01 ..... N77-33262*#

UILU-ENG-77-0504 ..... N77-33454 #
UILU-ENG-77-1714 ..... N77-33919 #
UILU-ENG-77-1736 ..... N77-33424 #
UILU-ENG-77-2215 ..... N77-33872 #

UIUCDCS-R-77-862 ..... N77-33919 #
UIUCDCS-R-77-871 ..... N77-33424 #

UM-HSRI-BI-77-19 ..... N77-33865 #

UM-HSRI-76-33 ..... N77-33864 #

UMTA-NY-06-0058-77-1 ..... N77-33699 #

UMTA-VA-11-0002-77-2 ..... N77-34059 #

UO-LCCH-BOI-77-008 ..... N77-34056 #

UO-LCCH-CHA-77-008 ..... N77-33874 #

USAAMRDL-TR-76-41A ..... N77-33207 #
USAAMRDL-TR-77-8 ..... N77-33132 #
USAAMRDL-TR-77-17 ..... N77-33101 #

USAARL-77-15 ..... N77-33961 #

USAEHA-51-0923-77 ..... N77-33371 #

USAFETAC-8065B ..... N77-33752 #
USAFETAC-8088B ..... N77-33751 #

USAFIFC-TR-77-1 ..... N77-33218 #

USBAMRDL-TN-25 ..... N77-33155 #

UTEC-ME-76-211 ..... N77-33376 #

UTRC/R77-912532-4 ..... N77-33353 #

UVA/525023/ESS77/103 ..... N77-33728 #
UVA/528060/ESS77/111 ..... N77-33148*#

VA-99-R070-2 ..... N77-33670 #

WRE-TM-1788(W) ..... N77-33733 #

WRE-TM-1730(WR/D) ..... N77-33480 #

WRE-TR-1816(W) ..... N77-33718 #

W77-08609 ..... N77-33765 #
W77-08927 ..... N77-33702 #
W77-09051 ..... N77-33593 #
W77-09268 ..... N77-33595 #

X-661-77-237 ..... N77-34092*#
X-680-77-251 ..... N77-34062*#
X-692-77-196 ..... N77-34068*#
X-692-77-213 ..... N77-34091*#
X-922-77-241 ..... N77-33710 #
X-922-77-242 ..... N77-33588*#

Y-DA-7055 ..... N77-33334 #

Y-2070 ..... N77-33510 #
Y-2071 ..... N77-33306 #
Y-2075 ..... N77-33531 #

☆U.S. GOVERNMENT PRINTING OFFICE: 1977-261-365/24

PUBLIC COLLECTIONS OF NASA DOCUMENTS

DOMESTIC

NASA distributes its technical documents and bibliographic tools to eleven special libraries located in the organizations listed below. Each library is prepared to furnish the public such services as reference assistance, interlibrary loans, photocopy service, and assistance in obtaining copies of NASA documents for retention.

CALIFORNIA
University of California, Berkeley

COLORADO
University of Colorado, Boulder

DISTRICT OF COLUMBIA
Library of Congress

GEORGIA
Georgia Institute of Technology, Atlanta

ILLINOIS
The John Crerar Library, Chicago

MASSACHUSETTS
Massachusetts Institute of Technology, Cambridge

MISSOURI
Linda Hall Library, Kansas City

NEW YORK
Columbia University, New York

OKLAHOMA
University of Oklahoma, Bizzell Library

PENNSYLVANIA
Carnegie Library of Pittsburgh

WASHINGTON
University of Washington, Seattle

NASA publications (those indicated by an "*" following the accession number) are also received by the following public and free libraries:

CALIFORNIA
Los Angeles Public Library
San Diego Public Library

COLORADO
Denver Public Library

CONNECTICUT
Hartford Public Library

MARYLAND
Enoch Pratt Free Library, Baltimore

MASSACHUSETTS
Boston Public Library

MICHIGAN
Detroit Public Library

MINNESOTA
Minneapolis Public Library

MISSOURI
Kansas City Public Library
St. Louis Public Library

NEW JERSEY
Trenton Public Library

NEW YORK
Brooklyn Public Library
Buffalo and Erie County Public Library
Rochester Public Library
New York Public Library

OHIO
Akron Public Library
Cincinnati Public Library
Cleveland Public Library
Dayton Public Library
Toledo Public Library

TENNESSEE
Memphis Public Library

TEXAS
Dallas Public Library
Fort Worth Public Library

WASHINGTON
Seattle Public Library

WISCONSIN
Milwaukee Public Library

An extensive collection of NASA and NASA-sponsored documents and aerospace publications available to the public for reference purposes is maintained by the American Institute of Aeronautics and Astronautics, Technical Information Service, 750 Third Avenue, New York, New York 10017.

EUROPEAN

An extensive collection of NASA and NASA-sponsored publications is maintained by the British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. By virtue of arrangements other than with NASA, the British Library Lending Division also has available many of the non-NASA publications cited in *STAR*. European requesters may purchase facsimile copy of microfiche of NASA and NASA-sponsored documents, those identified by both the symbols "#" and "*", from: ESA - Space Documentation Service, European Space Agency, 8-10 rue Mario-Nikis, 75738 Paris CEDEX 15, France.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $300

SPECIAL FOURTH CLASS MAIL
Book

POSTAGE AND FEES PAID
NATIONAL AERONAUTICS AND
SPACE ADMINISTRATION
NASA-451

U.S.MAIL

POSTMASTER: If undeliverable (Section 158 Postal Manual) Do Not Return

on 158
t Return